THOMPSON'S BUSINESS ARITHMETIC

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THOMPSON'S BUSINESS ARITHMETIC

BY

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PREFACE

In selecting and arranging the content material in this book, a very definite plan has been followed, with a view to making it adaptable to the varying needs of the many pupils who study business arithmetic, and to diverse teaching conditions.

The book is divided into two parts. Part I is confined almost entirely to principles and methods. It is both exploratory and expository. Each new feature taken up is fully explained. A type solution is given according to an approved method, which is fully explained. Following each model solution there is sufficient problem material to serve as a teaching medium in the development of the lesson. The problems following each solution, although true to the principle and method involved, are sufficiently varied to insure sound pedagogical processes. Following each subdivision of the content are a number of general problems, which will serve to test the pupils' understanding of the principles and methods covered in the lessons in this particular subdivision. These problems may be used for general review purposes.

Part II contains 111 graded assignments and 63 review assignments or test assignments, so planned as to admit of unusual flexibility in their use. The first 96 assignments are classified as "A" and "B." The "A" assignments consist of problems somewhat easier than the problems in the "B" assignments. These assignments are so prepared and arranged as to insure a reasonably strict sequence and a continuity conducive to increased understanding and ability on the part of the pupil. The review test assignments are arranged to follow in order each "B" assignment. Accuracy is featured in each test, which is made up of problems intended to give the teacher a very definite check-up on each pupil's understanding of the subject.

In assembling the material for this book, due consideration has been given to its practicability. Those problems having a practical bearing have been selected from original sources.

Involved problems and problems typifying extreme situations have been omitted. As a special feature, there has been included a limited number of projects, ten in all, in which arithmetic is given a definite application. These projects are so planned as to admit of many interpretations and much discussion, which should lead to some research in order to settle many questions which will naturally arise.

In the preparation of this book, the aim from the outset has been to furnish ample teaching material, and thus to make the whole plan flexible and adaptable under varying conditions. This plan has been sufficiently tried out over a period of time in a number of classes to insure both its flexibility and its adaptability. It makes possible class instruction, group instruction, or individualized instruction, with equally satisfactory results. The contract plan of assigning work, whereby each pupil may progress in proportion to his effort and ability, may be followed.

In conclusion, the author wishes to state that this book is the outgrowth of many years of experience in business, in the classroom as a teacher and a supervisor, and also as a teacher of teachers. As a result of this experience, he realizes what are the teaching problems in this subject. He has attempted, in part at least, to solve these problems by adopting an entirely new plan of organization and arrangement of material which will afford greater possibilities for practical instruction in this subject, resulting, it is hoped, in greater satisfaction to pupils and teachers.

In this connection, the author wishes to acknowledge his gratitude to the many business men and teachers who have given valuable advice and assistance in the preparation of this material and plan. He wishes to express his indebtedness particularly to those teachers who are associated with him, who have subjected the work while in MS. to the practical test of classroom use, giving much constructive criticism and many valuable suggestions, all of which has aided greatly in the preparation and arrangement of this book.

THE AUTHOR

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Part I

PRINCIPLES AND METHODS

BUSINESS ARITHMETIC

Part I

PRINCIPLES AND METHODS

Fundamentally, arithmetic is of greater importance at the present time than it has ever been, and it is increasingly so because of our remarkable social and economic development. In order to comprehend the problems resulting from the many industrial and commercial activities with which one is brought into more or less direct contact, one must know practical arithmetic.

NUMBERS

Numbers are expressed by words, by figures, and by letters.

Roman System

I	V	X	L	C	D	M
1	5	10	50	100	500	1000

I = 1		VIII = 8		XV = 15		XL = 40	
II = 2		IX = 9		XVI = 16		L = 50	
III = 3		X = 10		XVII = 17		LXXXIV = 84	
IV = 4		XI = 11		XVIII = 18		XC = 90	
V = 5		XII = 12		XIX = 19		CX = 110	
VI = 6		XIII = 13		XX = 20		CCLX = 260	
VII = 7		XIV = 14		XXX = 30		DCXCVII = 697	

A horizontal line over a letter increases its value one thousand times.

$\overline{\text{CXIX}} = 119{,}000$ $\overline{\text{LIX}} = 59{,}000$

Repeating a letter doubles its value.

X = 10, XX = 20

A letter of less value written after a letter of greater value is added to the greater value.

LX = 60

A letter of less value written before a letter of greater value is subtracted from the greater value.

XC = 90

Exercise

Write the following numbers in Roman notation:

24	95	240	1420	12,000
46	110	325	1566	150,000
84	135	676	1784	1,820,000

Arabic Figures

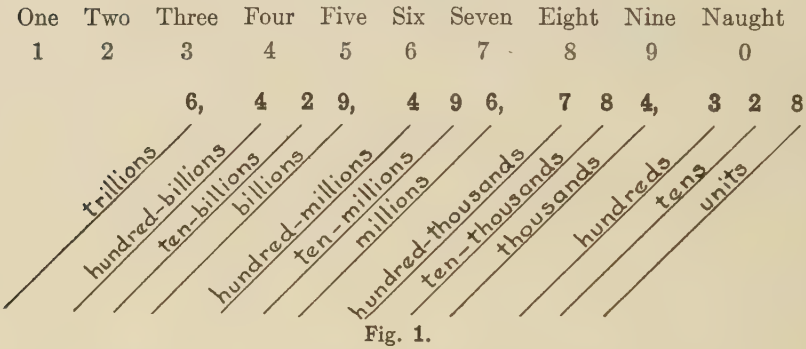


Fig. 1.

Six trillion, four hundred twenty-nine billion, four hundred ninety-six million, seven hundred eighty-four thousand, three hundred twenty-eight.

Reading Numbers

1642 is read "sixteen hundred forty-two."

8248 is read "eighty-two hundred forty-eight."

24,328 is read "twenty-four thousand three twenty-eight."

864,028 is read "eight sixty-four thousand naught twenty-eight."

5,220,312 is read "five million two twenty thousand three twelve."

Exercise

Read the following numbers:

36,584	1,584,728	8,576,486,954
56,792	3,007,406	28,486,928,462
242,846	37,846,428	9,837,582,378,462

ADDITION

Addition is the process of finding the **sum** of two or more numbers.

The sign of addition is the +, or plus sign.

Addends are the numbers to be added. For example, in 3 + 5 = 8, the 3 and 5 are the addends.

Column Addition

Example.—Find the total number of pounds in five loads of coal which have the following weights, respectively:

4240 lb., 6320 lb., 4280 lb., 5860 lb., 6220 lb.

4,240 lb.
6,320 lb.
4,280 lb.
5,860 lb.
6,220 lb.
26,920 lb.

In column addition, place numbers directly under each other, grouping as many numbers as possible when adding. For example, in the second column group in this manner: (2 and 6) 8, (8 and 2) 18, (4) 22. A little practice in grouping will improve one's ability to group more numbers and to add accurately and rapidly.

Problems

1. Find the number of pounds of wheat in a bin into which loads of wheat of the following weights have been dumped: 3815 lb., 4120 lb., 2948 lb., 4675 lb., 2884 lb., 5280 lb., 2845 lb., 5466 lb.

2. A dealer during a period of six months bought the following quantities of cheese: Jan. 10, 320 lb.; Feb. 4, 288 lb.; Feb. 26, 276 lb.; March 16, 344 lb.; April 1, 378 lb.; April 21, 412 lb.; May 7, 366 lb.; June 1, 415 lb.; June 22, 388 lb. How many pounds did he buy?

3. A contractor employed 9 mechanics, and each one worked for him a certain number of days during the year, as follows: No. 1, 183 days; No. 2, 216 days; No. 3, 288 days; No. 4, 199 days; No. 5, 176 days; No. 6, 217 days; No. 7, 209 days; No. 8, 277 days; No. 9, 218 days. How many days did they all work?

4. During one week in a department store, 10 salesladies sold the following quantities of dress goods: No. 1, 1288 yd.; No. 2, 1376 yd.; No. 3, 1698 yd.; No. 4, 1149 yd.; No. 5, 1774 yd.; No. 6, 1499 yd.; No. 7, 1383 yd.; No. 8, 2467 yd.; No. 9, 2582 yd.; No. 10, 1967 yd. Find the total number of yards sold.

5. In a certain city there are 12 schools with an enrollment in each school as follows: No. 1, 816; No. 2, 921; No. 3, 488; No. 4, 762; No. 5, 589; No. 6, 1127; No. 7, 394; No. 8, 1297; No. 9, 1642; No. 10, 884; No. 11, 928; H. S., 1689. How many pupils are attending the public schools in this city?

Horizontal Addition

Example.—Find the total number of pounds of sugar sold in the following quantities: 7 lb., 14 lb., 25 lb., 7 lb., 5 lb., 21 lb., 25 lb., 14 lb.

Add from left to right.

$$7 + 14 + 25 + 7 + 5 + 21 + 25 + 14 = 118 \text{ lb.}$$

The sign = is the sign of equality. It is the sign put between mathematical expressions to indicate an equation. An equation is a balanced statement or a state of being equal. The sign = is often used as a means of announcing the result or answer. For example: 18 + 11 = 29 means that 18 and 11, when taken together, have the same value as has 29, or that 29 and (18 + 11) are equal. (See fig. 2.)

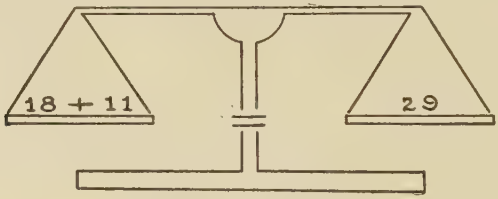


Fig. 2.—Equality.

Short Cuts in Mental Addition

In adding 49 to 175, add 50 and subtract 1. This device can be used in adding many combinations, such as 35 + 99 = (35 + 100 − 1); 128 + 97 = (128 + 100 − 3); 187 + 89 = (187 + 90 − 1), etc.

In adding 344 and 128 mentally, add from left to right: 344 + 100 + 20 + 8 = 472. This avoids carrying. Add 587 and 324 from left to right: 587 + 300 + 20 + 4 = 911.

Problems

1. How many pounds are there in nine parcel post packages of the following weights: 12 lb., 21 lb., 14 lb., 8 lb., 27 lb., 34 lb., 13 lb., 17 lb., 28 lb.? Place each number in position, use the sign +, and add from left to right.

2. At a certain railway ticket office, tickets sold on particular days during a given week were: Monday, 73; Tuesday, 88; Wednesday, 94; Thursday, 114; Friday, 57; Saturday, 147; Sunday, 78. How many tickets were sold during the entire week?

3. Two young men went on a 10-day motor trip. The distance they traveled each day was as follows: 128 miles the first day, 112 miles the second day, 141 miles the third day, 132 miles the fourth day, 166 miles the fifth day, 95 miles the sixth day, 128 miles the seventh day, 133 miles the eighth day, 154 miles the ninth day, 74 miles the tenth day. How many miles did they travel in all?

4. Find totals and grand totals as indicated. Do not copy the problem, but place results on a separate sheet of paper.

SALESMEN'S SALES OF SILK STOCKINGS FOR APRIL, MAY, AND JUNE

Salesmen	April	May	June	Totals
E. H. Case	$245 60	$312 50	$411 20	
O. E. Moore	221 30	415 20	503 12	
A. H. Berch	311 15	241 16	423 30	
J. H. Hooker	610 22	543 30	452 21	
M. A. King	334 12	221 23	434 15	
Totals				

5. Find the total sales in the different departments and the totals, as indicated.

	Furniture	Table Ware	Linen	Totals
Monday	$324 80	$272 60	$184 95	
Tuesday	273 60	312 80	327 45	
Wednesday	672 45	237 60	248 90	
Thursday	711 50	371 45	188 20	
Friday	316 35	288 60	342 15	
Saturday	1124 50	431 70	583 25	
Totals				

Checking Results in Addition

Casting out the 9's.—A very simple method of checking results in addition is to cast out the 9's. See the accompanying illustration.

Take the first number, as for example 7428, and add from left to right: $7 + 4 + 2 + 8 = 21$. Then divide the result by 9. ($21 \div 9 = 2$, with 3 remaining.) Place the 3 in position (see illustration). Treat each of the other numbers in the same way, placing the remainders in position. Add the remainders and divide the sum by 9. Treat the answer in the same way as the other numbers, and if, after the 9's are cast out, the remainder in the answer is the same as the remainder in the problem, the answer is probably correct. (The key number in the illustration is 8.)

7428 − 3
8962 − 7
3754 − 1
5971 − 4
6428 − 2
32543 − 17 − 8
− 8

Casting out 11's.—The 11's may be cast out as follows: Beginning from the right, add the figures in the odd places, and from this sum subtract the sum of the figures in the even places. For example, the excess of 5834 is $4 + 8 = 12 - 3 - 5 = 4$.

If the sum of the figures in the odd places is smaller than the sum of the figures in the even places, it is necessary to add 11 or some multiple of 11 (22, 33, etc.) to the sum of the figures in the odd places before subtracting the figures in the even places. For example, the excess of 11's in 8153 is $3 + 1 + 11 = 14 - 5 - 8 = 1$. See the accompanying illustration.

5928 − 10
4372 − 5
4963 − 2
2821 − 5
18084 − 22 = 0

$8 + 9 - 2 - 5 = 10$
$2 + 3 - 7 - 4 = 5$
$3 + 9 - 6 - 4 = 2$
$1 + 8 - 2 - 2 = 5$
22

The excess of 11 in 22 = 0
In the result: $4 + 0 + 1 + 11 - 8 - 8 = 0$

The excess being zero in each sum, the addition is in all probability correct.

For numbers between 11 and 100, if the unit number is the larger, the difference between the unit number and the tens number is the excess. Hence, in 48 the excess is 4; in 56 the excess is 1, and so forth. If the tens number is larger, add 11 to the units number and subtract the tens number; the difference is the excess. Hence, in 84, $4 + 11 = 15 - 8 = 7$, the excess; in 72, $2 + 11 = 13 - 7 = 6$, the excess; or divide the whole number by 11, and the remainder is the excess. Hence: $84 \div 11 = 7\frac{7}{11}$, and the excess is 7.

Adding columns both ways.—Another way of checking results in addition is to add each column both ways.

30	3924	30
30	8267	18
18	7824	30
30	9267	30
33210	3928	33210
	33210	

Add all columns upward and place results to the right, as shown in the illustration; then add all columns downward and place results to the left; add results of each column, as shown in the illustration.

Civil Service method.—Another plan, sometimes called the "Civil Service method," is very effective in adding long columns where there is a possibility of frequent interruptions. Add each column and place the result in position, as illustrated. When this method is used, the one adding can stop at any point, to check and note his result, and then later continue from that point. This method also enables one to check by adding the columns in reverse order.

8427
6928
5962
7429
2964
30
18
35
28
31710

Problems

Add the following problems, applying to each problem all the methods of checking explained:

1.	2.	3.	4.
8926	2164	146	$ 34.60
4928	4826	231	117.20
1567	7328	342	2.44
3824	9267	874	15.87
2786	3724	5962	221.11
7643	2876	28	37.84
5287	4287	743	372.66
2761	3721	42	8.75

SUBTRACTION

By one method, subtraction is a process of finding how much must be added to a certain number to make the sum equal to another certain number. For example: How much must be added to 42 to make the sum 87?

By another method, subtraction is the process of finding the difference between two numbers or finding how much remains when one number is taken from another number. For example: When 38 is taken from 83, the remainder is 45.

Minuend.—The minuend is the larger number, and if the first method of subtraction mentioned is used, it is called the **sum**; if the second method is used, it is the number from which another number is taken.

Subtrahend.—The subtrahend is the number to which another number is added, the sum equaling a certain number called the **minuend** or the number taken from a certain number called the **minuend.**

Remainder.—The remainder is the number to be found, or the difference between the number called the **minuend** and the number called the **subtrahend.**

Uses of subtraction.—The most common uses of subtraction in business are in making change and in finding balances of accounts.

Problems

1. Find the amount of change by the addition method:

Amount of Purchase	*Money Tendered*	*Change*
$ 5.45	$10 bill	?
6.72	$20 bill	?
3.38	$ 5 bill	?
11.67	$10 and $5 bills	?
23.88	$50 bill	?

2. Copy the following problems and find the difference, or remainder, in each:

54926	64327	27268	32743
28879	37843	19789	25867
73283	33584	52026	37843
58897	14796	1937	29679

Proving Subtraction

The sum of the subtrahend and the remainder equals the minuend. Thus, to prove a problem in subtraction such as 87 − 43 = 44, add 43 and 44 and see whether the sum is 87.

Problem

3. Find the net weights of the following loads of coal, and prove your results:

Gross Weight	*Weight of Truck*	*Net Weight*	*Gross Weight*	*Weight of Truck*	*Net Weight*
10640	4460		9970	3980	
10380	4460		8950	3870	
9880	3990		10440	4180	
9570	4125		9885	3970	
10560	4125		10430	4180	

MULTIPLICATION

Multiplication is the process of taking one number, called the **multiplicand,** as many times as there are units in another number, called the **multiplier.** The sign of multiplication is ×.

The number to be multiplied is the multiplicand; the number by which another number is multiplied is the multiplier; and the result of the multiplication is called the **product.**

Thus, in

$$\$24 \times 32 = \$768$$

\$24 is the multiplicand, 32 is the multiplier, and \$768 is the product.

Problems

Multiply the following, keeping in mind that any result is practically useless unless it is *correct:*

1. 5963 134	**2.** 3862 326	**3.** 7645 243	**4.** 8367 423	**5.** 6758 534
	6. 7382 428	**7.** 8376 692	**8.** 4863 674	

General Problems

1. An automobile was driven, on an average, 312 miles a day for 43 days. How far was it driven?

2. A man raised, on an average, 87 bu. of corn per acre on 296 acres. How many bushels of corn did he raise?

3. If it requires 3487 ties to lay one mile of track, how many ties will be required to lay 485 miles of track?

4. In one county an average of 43 bu. of oats per acre was raised on 1287 acres; in another county an average of 56 bu. per acre was raised on 1788 acres. How many bushels were raised in both counties?

5. The expenses per student for one year in a certain college averaged \$987. What were the total expenses of 1648 students?

6. Find the total cost of 437 yd. of silk at \$1.75 a yard; 684 yd. of gingham at 48¢ a yard; 768 yd. of broadcloth at \$2.56 a yard.

7. Find the total cost of 887 lb. at 64¢ a pound; 958 lb. at 47¢ a pound; 1378 lb. at 83¢ a pound.

8. Find the total cost of 6435 bu. of wheat at \$1.37 a bushel; 5958 bu. of rye at \$1.08 a bushel; 9374 bu. of oats at 67¢ a bushel.

Checking Results in Multiplication

1. Casting out 9's.—

Example.—

$$\begin{array}{rl} 564 - 6 & \\ 86 - 5 & \\ \hline 3384 & 30 - 3 \\ 4512 & \\ \hline 48504 - 3 & \end{array}$$

The remainders, after casting out 9's in 564 and 86, are 6 and 5. The remainder after casting out 9's in the product of 6 and 5 ($6 \times 5 = 30$) is 3. The remainder after casting out 9's in the product 48504 is 3. Therefore the multiplication is in all probability correct.

2. Casting out 11's.—

Example.—

$$\begin{array}{r} 864 - 6 \\ 67 - 1 \\ \hline 6048 - 6 \\ 5184 \\ \hline 57888 - 6 \end{array}$$

In 864, the remainder is $4 + 8 = 12 - 6 = 6$. In 67, the remainder is $7 - 6 = 1$, and in 57888, it is $8 + 8 + 5 - 8 - 7 = 6$, the remainder in the product, so the product is, in all probability, correct.

3. Interchanging multiplier and multiplicand.—This is one of the most familiar methods of checking multiplication results.

Example.—

$$\begin{array}{r} 374 \\ 286 \\ \hline 2244 \\ 2992 \\ 748 \\ \hline 106964 \end{array} \qquad \begin{array}{r} 286 \\ 374 \\ \hline 1144 \\ 2002 \\ 858 \\ \hline 106964 \end{array}$$

4. Dividing the product by one of the numbers.—This is a certain check, as the result must be the other number.

$$286\overline{)106964}\ 374$$

Short Cuts in Multiplication

1. To multiply numbers between 10 and 20.—

Example.—$16 \times 15 = ?$ Add the 5 to 16 $(16 + 5 = 21)$ or the 6 to the 15 $(6 + 15 = 21)$; annex a cipher (210); multiply 5 by 6 (30); add 210 and 30, which gives 240, the product.

Example.—$17 \times 18 = ?$ $17 + 8 = 25$; annex a cipher (250); multiply 8 by 7 (56); add 250 and 56, and obtain 306.

2. With a little practice, it will be possible to multiply three and four numbers mentally, placing the product in position as illustrated following:

Examples.—

427
486

4×4	8×4 4×2 $+7$	6×4 8×2 4×7 $+7$	6×2 8×7 $+4$	6×7
20	7	5	2	2

6847
5926

$5 \times 6 +$ 10	$9 \times 6 +$ $5 \times 8 +$	$2 \times 6 +$ $9 \times 8 +$	$6 \times 6 +$ $2 \times 8 +$ $9 \times 4 +$	$6 \times 8 +$ $2 \times 4 +$ $9 \times 7 +$	$6 \times 4 +$ $2 \times 7 +$ 4	6×7
40	11	$5 \times 4 +$	$5 \times 7 +$	4	42	42
	105	13	12	123		
		117	135			
40	5	7	5	3	2	2

Make the computations between the perpendicular lines mentally, and place the result in position.

Problems

Multiply:

1. $16 \times 14 =$ **4.** $17 \times 18 =$ **7.** $19 \times 16 =$

2. $14 \times 19 =$ **5.** $13 \times 12 =$ **8.** $14 \times 18 =$

3. $17 \times 12 =$ **6.** $15 \times 17 =$ **9.** $18 \times 15 =$

10. 47 28	**13.** 87 29	**16.** 528 347	**19.** 328 573	**22.** 2431 322	**25.** 5634 4325
11. 84 32	**14.** 96 53	**17.** 623 534	**20.** 694 287	**23.** 3524 432	**26.** 64827 423
12. 67 58	**15.** 72 84	**18.** 562 432	**21.** 398 562	**24.** 4326 3142	**27.** 74928 876

DIVISION

Division is the process of finding how many times one number is contained in another number. The sign of division is $\div$.

Example.—144 ÷ 24 = 6. In the example given, the 144, or the number divided, is called the **dividend**; the 24, or the number by which it is divided, is called the **divisor**; and the 6, or the result of the division, is called the **quotient.**

Problems

Divide:

1. 2472 ÷ 24 =	**4.** 12844 ÷ 38 =	**7.** 168560 ÷ 784 =
2. 8960 ÷ 56 =	**5.** 15928 ÷ 88 =	**8.** 159488 ÷ 896 =
3. 9648 ÷ 72 =	**6.** 74688 ÷ 96 =	**9.** 186204 ÷ 526 =

Checking Results in Division

Example.—98 ÷ 14 = 7.

Proof.—The product of the divisor, 14, and the quotient, 7, equals 98. This proves that the division is correct.

Example.—114 ÷ 21 = 5, with a remainder of 9.

Proof.—To prove, multiply 21 by 5 and add the remainder, 9. 21 × 5 = 105 + 9 = 114. This proves that the division is correct.

Casting out 9's.—

Example.—16514 ÷ 246 = 67 with a remainder of 32.

Proof.—

16514 = 246 × 67 + 32
In 16514 the excess of 9's is 8
In 246 the excess of 9's is 3
In 67 the excess of 9's is 4
In 32 the excess of 9's is 5
4 × 3 + 5 = 17

In 17 the excess of 9's is 8. The excess of 9's in the dividend is equal to the excess of 9's in the product of the excesses in the divisor and quotient, plus the excess in the remainder; therefore, the division is probably correct.

Casting out 11's.—

Example.—4896 ÷ 63 = 77, with a remainder of 45

Proof.—

$$4896 = 63 \times 77 + 45$$

In 4896 the excess of 11's is 1
In 63 the excess of 11's is 8
In 77 the excess of 11's is 0
In 45 the excess of 11's is 1

$$8 \times 0 + 1 = 1$$

The excess of 11's in the dividend is 1; the excess of 11's in the divisor is 8; the excess of 11's in the quotient is 0; and the excess of 11's in the remainder is $1 + 8 \times 0 + 1 = 1$, and, as the excess in each case is the same, the result is probably correct.

Casting out 9's or 11's in division is, however, too involved to be very practical, and for most purposes it is better to multiply the quotient by the divisor, add the remainder, and see whether the result of this operation equals the dividend.

Problems

1. A man owned 36,400 acres of land, and divided it into farms of 125 acres each. (a) How many farms did he have? (b) How many acres did he have remaining?

2. A miller had 12,920 bu. of wheat stored in a bin from which he milled into flour 380 bu. each day. How long did it take him to empty this bin?

3. The expenses of a town for one year were $30,221. If there were 643 taxpayers, what was the average amount each taxpayer had to pay?

4. In a certain school the cost of books was $968. If there were 242 pupils in the school, what was the average cost of the books per pupil?

5. In 312 loads of grain, there were 623,688 pounds. Find the average number of pounds in each load.

General Problems

1. A merchant bought 15 crates of eggs, each containing 30 dozen, for which he paid $9.20 a crate. He sold the eggs for 40¢ a dozen. How much did he gain?

2. A contractor agreed to haul 750 loads of stone for $3.75 a load. He hauled 15 loads each day. (a) How long did it take him to haul the stone? (b) How much did he earn on the contract?

3. A dealer bought 15 boxes of oranges, containing 21 dozen each, for $5.88 a box. After sorting out, from time to time, 4 dozen spoiled oranges, he sold the good oranges for 45¢ a dozen. How much did he gain?

4. How much did a dealer make by buying 4 carloads of potatoes, containing 3340 bushels, for \$1.22 a bushel and selling them for \$1.70 a bushel, if he paid \$248 freight and it cost him 11¢ a bushel to handle the potatoes?

5. A dealer bought 1000 boxes of apples for 80¢ a box. He paid \$250 freight, \$70 cartage, and \$30 storage. He desires to make a profit of 25¢ a box. For how much a box must he sell them?

6. A merchant's sales for 6 months were as follows: January, \$12,800; February, \$11,960; March, \$10,242.70; April, \$13,952.60; May, \$12,857.90; June, \$15,911.40. Find his average monthly sales for the six months' period. (Note. To find the average, find the sum of the several quantities and divide this sum by the number of quantities.)

7. A merchant owned three stores. His sales for the year in the first store were \$128,460.70; the sales in his second store were \$15,921.40 less than the sales in his first store; and the sales in his third store were \$3412.80 more than the sales in his second store. How much were the total sales in the three stores?

8. The expenses of a certain school were as follows: teachers' salaries, \$33,400; books, \$667.50; supplies, \$788.90; janitors, \$2400; fuel, \$600; incidental expenses, \$335.60. There were 434 pupils enrolled. Find the average cost per pupil of running the school.

9. A grain dealer bought 45,000 bu. of corn for 81¢ a bushel. He held it for 3 months and then sold it for 98¢ a bushel. His expenses were as follows: interest on money borrowed, \$450; storage, \$225; handling, \$300. If the shrinkage was 150 bushels, how much did he gain?

10. The cost of running a certain city for one year was as follows: schools, \$344,800; police department, \$58,900; department of public works, \$112,400; department of finance, \$32,400; administrative department, \$58,750; interest on bonds and bonds paid, \$51,630. The population was 46,400. Find the per capita cost of running the city.

11. The yearly expenses of a family of 5 persons were as follows: rent, \$540; food, \$1020; clothing, \$580; amusements, \$96.40; fuel, \$220; incidentals, \$144.60. Find (a) the average monthly expenses of the family, (b) the average yearly expenses of each member of the family, and (c) the amount saved if the income was \$4800.

12. A farmer owned three farms. From the first farm he sold \$2160 worth of produce the first year, from the second farm he sold \$320 less than from the first, and from the third he sold \$216.50 more than from the second. How many dollars worth of produce did he sell from all three farms?

COMPLEMENT METHOD

The **complement** of a number is the difference between that number and the unit of a next higher order. Thus, the complement of 8 is 2, because 2 is the difference between

8 and 10; 37 is the complement of 63, because 37 is the difference between 63 and 100.

In each case, 10 and 100 are units of the next higher order.

Examples.—

1. From 47 take 16.

$$47 - 16 = (47 + 4) - (16 + 4) = 31$$

2. From 52 take 7.

$$52 - 7 = (52 + 3) - (7 + 3) = 45$$

3. From 187 take 94.

$$187 - 94 = (187 + 6) - (94 + 6) = 93$$

This method of subtraction can be used to advantage when one number is to be taken from the sum of several numbers. It is adaptable in using an adding machine when the work consists largely of addition, with an occasional subtraction.

Adding by the Complement Method

342
628
423
587
806

Example.—Add 342, 628, 423, and from the sum take 587. The complement of 587 is 413. Add the complement 413 to the several numbers in the minuend and deduct 1000, the unit of the next higher order than the subtrahend. The difference is 806.

Problems

Solve the following by the complement method:

1. $51 + 67 + 34 - 73$

2. $29 + 37 + 43 - 59$

3. $317 + 542 + 128 - 437$

4. $294 + 321 + 471 - 617$

5. $1867 + 582 - 728$

6. $1593 + 427 - 267$

Multiplying by the Complement Method

Examples.—

1. Multiply 428 by 107.

42800
2996
45796

The multiplier is $100 + 7$. Multiply 428 by 100 by adding two ciphers. Add 7 times 428.

2. Multiply 352 by 96.

$$\begin{array}{r} 35200 \\ 1408 \\ \hline 33792 \end{array}$$

The multiplier is 100 − 4. Multiply 352 by 100 by adding two ciphers. Subtract 4 times 352.

Problems

Find the product of the following by the complement method:

1. 273 × 97	**3.** 428 × 104	**5.** 812 × 98
2. 617 × 103	**4.** 516 × 95	**6.** 783 × 104

FACTORING

Those numbers which, when multiplied together, make a number are the **factors** of that number. Thus, the factors of 28 are 4 and 7.

What are the factors of 9? 12? 18? 32? 48?

A number not exactly divisible by any number except itself and 1 is a **prime number.** Thus, 7 is a prime number.

Prime numbers are **prime factors.**

A number composed of two or more integral factors other than itself and 1 is a **composite number.** Thus, 21 is a composite number. (3 × 7 = 21).

Now, 6 and 4 are factors of 24, but they are not its prime factors. The prime factors are 2, 2, 2, and 3. By the factors of a number are usually meant its prime factors.

Testing for Factors

All even numbers are divisible by 2.

A number is even if its unit number is 2, 4, 6, 8, or 0.

A number is divisible by three if the sum of its digits is divisible by 3. Thus, 528 is divisible by 3 because 5 + 2 + 8 = 15, which is divisible by 3.

A number is divisible by 4 if its two digits at the right are ciphers or a number divisible by 4. Thus, 1864 is divisible by 4 because 64 is divisible by 4.

A number is divisible by 5 if its unit figure is 5 or 0. Thus, 5, 25, 30, 45, 60, are divisible by 5.

All even numbers the sum of whose digits is divisible by 3 are divisible by 6. Thus, 216, 369, 6732, are divisible by 6.

A number is divisible by 8 if its 3 right-hand digits express a number which is divisible by 8. Thus, 18,256 is divisible by 8, because 256 is divisible by 8.

A number is divisible by 9 if the sum of its digits is divisible by 9. Thus, 7659 is divisible by 9 because $7 + 6 + 5 + 9 = 27$, which is divisible by 9.

Numbers ending in 0 are divisible by 10.

A number is divisible by 11 if the sum of the digits in the even places equals the sum of the digits in the odd places, or if the difference between these two sums is 11 or some multiple of 11. Thus, 182,831 is divisible by 11 because $1 + 8 + 8 = 17$, $3 + 2 + 1 = 6$, $17 - 6 = 11$.

A number is divisible by 25 if the two right-hand digits are ciphers or express a number which is divisible by 25. Thus, 3875 is divisible by 25 because 75 is divisible by 25.

To find the prime factors of a number.—

Example.— Find the prime factors of 8652.

2 | 8652	The prime factors are $2 \times 2 \times 3 \times 7 \times 103 = 8652$. The large factors are 84 and 103. Unless one has access to factor tables, the only methods of determining large factors is by trying the prime numbers until the right one is found.
2 | 4326	
3 | 2163	
7 | 721	
103	

Problems

What are the prime factors of the following numbers?

1. 56	**4.** 168	**7.** 6448	**10.** 8050
2. 64	**5.** 976	**8.** 3848	**11.** 12625
3. 144	**6.** 1125	**9.** 10675	**12.** 15625

Multiplying by the Factor Method

Example.—Multiply 346 by 56.

346	346	
56	7	7 and 8 are the factors of 56. Multiplying 346 by 7 and then by 8 gives the same result as multiplying 346 by 56.
2076	2422	
1830	8	
19376	19376	

Problems

Multiply in the usual way and then prove by the factor method.

1. 491×63	**3.** 48×762	**5.** 849×24
2. 537×45	**4.** 72×324	**6.** 472×49

The "adding machine" method.—

Example.—

428	$428 \times 4 = 1712$	428
34		428
1712	$428 \times 30 = 12840$	428
1284	$428 \times 34 = 14552$	428
14552		428
		428
		428
		14552

Problems

Solve by the "adding machine" method.

1. 317×23	**2.** 287×32	**3.** 568×45

Other similar problems may be solved, if more practice is desired.

Dividing by the Factor Method

Example.—Divide 2016 by 28.

Instead of dividing by 28, divide by 4 and then by 7 ($4 \times 7 = 28$), these numbers being the factors of 28.

Where the factor method can be used, it serves an important purpose sometimes in proving problems in division.

Problems

Divide in the usual way, and prove your work by the factor method.

1. $4116 \div 49$	**3.** $8064 \div 72$	**5.** $5568 \div 96$
2. $5536 \div 32$	**4.** $2072 \div 56$	**6.** $10854 \div 81$

GREATEST COMMON DIVISOR

A **common divisor** of two or more numbers is a number which will exactly divide each of them. Thus, 3 is a common divisor of 9, 12, and 15.

In reducing common fractions to their lowest terms, it is necessary to find the greatest common divisor.

To find the greatest common divisor.—

Example.—Find the greatest common divisor of 36, 72, and 84.

Trial Method.—

2|36	2|72	2|84
2|18	2|36	2|42
3|9	2|18	3|21
3	3|9	7
	3	

It is apparent from the above that 2, 2, and 3 are common to 36, 72, and 84. Therefore, the greatest common divisor of the three numbers is the product of $2 \times 2 \times 3$, or 12.

To find the greatest common divisor of two or more numbers, first find the prime factors of each number. The product of all the prime factors is the greatest common divisor.

A more convenient method.—

2	36	72	84
2	18	36	42
3	9	18	21
	3	6	7

Arrange the numbers as shown and divide by some number which will exactly divide each of them. Continue doing this until no number can be found which will divide each new quotient. Multiply together all the divisors. The product 12 is the greatest common divisor.

Another method.—The greatest common divisor can also be found as follows:

36	72	84
36	0	12
0	0	12

Divide the other numbers by the smallest number; bring down the remainder and also the divisor. Divide again

by the smallest number, and continue this process until an exact divisor is found.

Examples.—

1. Find the greatest common divisor of 56, 120, and 216. $2 \times 2 \times 2 = 6$; therefore, 6 is the greatest common divisor.

2	56	120	216
2	28	60	108
2	14	30	54
	7	10	27

2. Find the greatest common divisor of 120, 288, and 344. As shown in this illustration, 8 is the greatest common divisor.

120	288	344
120	48	104
24	48	8
0	0	8

Problems

Find the greatest common divisor of the following numbers:

1. 72, 88, and 96
2. 68, 112, and 240
3. 95, 125, and 245
4. 48, 84, 96, and 124
5. 112, 228, 268, and 320
6. 21, 84, 126, and 147

LEAST COMMON MULTIPLE

A **common multiple** of a given number is any number that will contain that given number without a remainder. Thus, 18 is a common multiple of 6 and 9 because it contains 6 and 9, each without a remainder.

The **least common multiple** of any two or more given numbers is the smallest number that will contain each of those given numbers without a remainder. Thus, 36 is the least common multiple of 6, 9, and 12, because it is the smallest number that will contain them without a remainder.

To find the least common multiple.—In most cases the least common multiple can be found by inspection. Thus, in the case of 16, 24, and 48, it is apparent by inspection that 48 is the least common multiple.

Where the least common multiple cannot be found readily by inspection, the following is a good method to use:

Example.—Find the least common multiple of 12, 48, 84, and 96.

2	12	48	84	96
2	6	24	42	48
3	3	12	21	24
2	1	4	7	8
2	1	2	7	4
	1	1	7	2

Write the number as shown and divide by a factor of any two or more of the numbers. Continue this process until no further divisions can be made. Then multiply together all divisors and the quotients remaining; the product will be the least common multiple. Thus, $2 \times 2 \times 3 \times 2 \times 2 \times 7 \times 2 = 672$, which is the least common multiple.

Problems

Find the least common multiple of the following:

1. 3, 9, 18, and 27
2. 6, 15, 36, and 42
3. 5, 15, 25, and 35
4. 72, 88, 96, and 124
5. 24, 72, 128, and 240
6. 9, 27, 39, and 78

CANCELLATION

Cancellation is a method of shortening the process of multiplying fractions, dividing fractions, figuring interest, figuring the cost per square foot, as in lumber measurement, and of finding results in many other business computations.

Computation by means of cancellation.—

Examples.—

1. $28 \times 34 \times 48 \div 16 \times 56 \times 68 = \frac{3}{4}$

$$\frac{\overset{7}{\cancel{28}} \times \overset{17}{\cancel{34}} \times \overset{3}{\cancel{48}}}{\underset{2}{\cancel{16}} \times \underset{2}{\cancel{56}} \times \underset{2}{\cancel{68}}} = \frac{3}{2 \times 2} = \frac{3}{4}$$

The solution of this problem is an illustration of the method.

2. $52 \times 96 \div 39 = 128.$

$$\frac{\overset{4}{\cancel{52}} \times \overset{32}{\cancel{96}}}{\underset{3}{\cancel{39}}} = 4 \times 32 = 128$$

With 4 and 3, respectively, 13 is a factor of 52 and 39. 3 is contained in 96, 32 times. The result is $4 \times 32 = 128$.

3. $39 \times 54 \times 44 \times 80 \div 64 \times 78 \times 86 \times 120 = \frac{99}{688}$.

$$\frac{\overset{9}{\cancel{39}} \times \overset{18}{\cancel{54}} \times \overset{11}{\cancel{44}} \times \overset{2}{\cancel{80}}}{\underset{16}{\cancel{64}} \times \underset{2}{\cancel{78}} \times \underset{43}{\cancel{86}} \times \underset{3}{\cancel{120}}}$$

Result:

$$\frac{9 \times 11}{16 \times 43} = \frac{99}{688}$$

Where numbers above the line are not contained in numbers below the line, and where numbers below the line are not contained in numbers above the line, find factors common to both numbers above the line and numbers below the line. (See illustration.)

Problems

Solve by cancellation:

1. $8 \times 12 \times 18 \times 32 \div 4 \times 6 \times 9 \times 16$

2. $27 \times 84 \times 96 \times 124 \div 9 \times 12 \times 16 \times 31$

3. $5 \times 30 \times 65 \times 125 \div 15 \times 75 \times 95 \times 150$

4. $3 \times 27 \times 48 \times 81 \div 6 \times 9 \times 54 \times 210$

5. $56 \times 68 \times 72 \times 84 \div 36 \times 92 \times 98 \times 136$

6. How many pounds of bacon, at 44¢ a lb., can be exchanged for 22 doz. eggs at 56¢ a doz.?

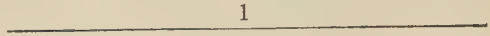
7. How many days, of 8 hrs. each, will a man have to work at 90¢ an hour to pay for 8 tons of coal at $14.40 a ton?

8. A country merchant desires to purchase 120 doz. oranges at 42¢ a doz. How many pounds of butter at 48¢ a lb. will he have to give in exchange for the oranges?

9. If 84 bbl. of apples cost $546, how much will 212 bbl. cost at the same price per barrel?

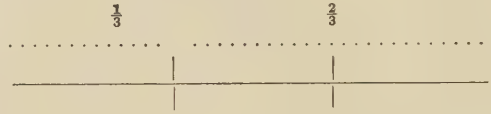
10. If 12 men, working at the rate of 80¢ an hour, earned $1843.20 in 24 days of 8 hours each, how long will it take 18 men, working 8 hours a day at 80¢ an hour, to earn the same amount?

FRACTIONS



This line represents a unit, or one line.

This line is divided into two parts; $\frac{1}{2}$ is one of the equal parts of a unit.



This line is divided into thirds; $\frac{1}{3}$ in one part and $\frac{2}{3}$ in the other part. Hence, a fraction may be one or more equal parts of a unit.

A **fraction** is composed of a **numerator,** which is written above, and a **denominator,** which is written below, a horizontal line. Thus, $\frac{5}{8}$ is a fraction.

Common fractions are classified as simple, compound, and complex; proper and improper; and as parts of mixed numbers.

A **simple fraction** is one whose numerator and denominator are whole numbers. Thus, $\frac{7}{1\frac{1}{2}}$ is a simple fraction.

A **compound fraction** is a fraction of a fraction. Thus, $\frac{3}{4}$ of $\frac{5}{6}$ is a compound fraction.

A **complex fraction** is one in which either or both the numerator or denominator are not whole numbers. Thus, $\frac{5\frac{3}{8}}{20}$, $\frac{6}{7\frac{1}{2}}$, and $\frac{3\frac{3}{4}}{5\frac{2}{3}}$ are complex fractions.

A **proper fraction** is one in which the numerator is less than the denominator. Thus, $\frac{4}{9}$ and $\frac{16}{25}$ are proper fractions.

An **improper fraction** is one in which the numerator equals or exceeds the denominator. Thus, $\frac{7}{7}$ and $\frac{92}{31}$ are improper fractions.

A **mixed number** is a whole number and a fraction taken together. Thus, $3\frac{5}{8}$ and $28\frac{4}{5}$ are mixed numbers.

Fundamental Principles of Fractions

To change an improper fraction to a whole or a mixed number.—

Example.—Change the improper fraction $\frac{31}{4}$ to a whole or a mixed number.

$$\frac{31}{4} = 31 \div 4 = 7\frac{3}{4}$$

Hence,

$$\frac{31}{4} = 7\frac{3}{4}$$

To change an improper fraction to a whole or a mixed number, divide the numerator by the denominator.

Problems

Change the following improper fractions into whole or mixed numbers:

1. $\frac{43}{6}$ 2. $\frac{54}{7}$ 3. $\frac{72}{9}$ 4. $\frac{81}{11}$ 5. $\frac{137}{12}$

To change a mixed number to an improper fraction.—

Example.—Change $8\frac{5}{11}$ to an improper fraction.

$$8 \times 11 = 88; 88 + 5 = 93$$

Hence,

$$8\frac{5}{11} = \frac{93}{11}$$

To change a mixed number to an improper fraction, multiply the whole number by the denominator, add the numerator to the product, and place the result over the denominator.

Problems

Change the following mixed numbers to improper fractions:

1. $5\frac{3}{8}$ 2. $15\frac{5}{9}$ 3. $37\frac{4}{15}$ 4. $58\frac{1}{9}$ 5. $143\frac{7}{16}$

To reduce a fraction to its lowest terms.—

Example.—Reduce $\frac{124}{288}$ to its lowest terms.

$$4\left|\frac{124}{288} = \frac{31}{72}\right.$$

Hence, $\frac{31}{72}$ is a fraction of lowest terms equal to $\frac{124}{288}$.

To reduce a fraction to its lowest terms, divide both its numerator and denominator by any common divisor and continue to divide until no common divisor greater than one can be found.

Problems

Reduce the following fractions to their lowest terms:

1. $\frac{28}{96}$ **2.** $\frac{134}{268}$ **3.** $\frac{385}{665}$ **4.** $\frac{455}{560}$ **5.** $\frac{595}{1190}$

To change a fraction to higher terms.—

Example.—Change $\frac{5}{8}$ to 40ths. 40 is to be the new denominator. $40 \div 8 = 5$, the number both terms of the fraction, $\frac{5}{8}$, must be multiplied by to change it to the higher terms. The result is $\frac{25}{40}$.

$$40 \div 8 = 5$$
$$\frac{5}{8} = \frac{5 \times 5}{8 \times 5} = \frac{25}{40}$$

To change a fraction to higher terms, multiply both numerator and denominator by the same number.

Problems

Change the following fractions to higher terms:

1. $\frac{3}{4}$ to 24ths. **3.** $\frac{3}{7}$ to 84ths. **5.** $\frac{9}{11}$ to 88ths.

2. $\frac{5}{8}$ to 72ds. **4.** $\frac{11}{16}$ to 96ths. **6.** $\frac{7}{25}$ to 100ths.

To change a compound fraction to a simple fraction.—

Example.—Change $\frac{5}{6}$ of $\frac{7}{8}$ to a simple fraction.

$$\frac{5}{6} \text{ of } \frac{7}{8} = \frac{5}{6} \times \frac{7}{8} = \frac{35}{48}$$

Hence, the simple fraction, $\frac{35}{48}$, is equal to the compound fraction, $\frac{5}{6}$ of $\frac{7}{8}$.

To change a compound fraction to a simple fraction, place the product of the numerators over the product of the denominators.

Problems

Change the following compound fractions to simple fractions:

1. $\frac{5}{9}$ of $\frac{7}{12}$ **2.** $\frac{8}{11}$ of $\frac{5}{16}$ **3.** $\frac{17}{24}$ of $\frac{3}{8}$

4. $\frac{11}{23}$ of $\frac{16}{31}$

To change a complex fraction to a simple fraction.—

Example.—Change $\frac{3\frac{2}{5}}{5\frac{1}{8}}$ to a simple fraction.

$$\frac{3\frac{2}{5}}{5\frac{1}{8}} = 3\frac{2}{5} \div 5\frac{1}{8} = \frac{17}{5} \div \frac{41}{8} = \frac{17}{5} \times \frac{8}{41} = \frac{136}{205}$$

To change a complex fraction to a simple fraction, divide the numerator by the denominator.

Another method of simplifying a complex fraction is this: *multiply both the numerator and the denominator by a number that does not change the value of the fraction.*

$$\frac{3\frac{2}{5}}{5\frac{1}{8}} = \frac{3\frac{2}{5}}{5\frac{1}{8}} \times \frac{40}{40} = \frac{136}{205}$$

By multiplying $3\frac{2}{5}$ by 40, the result is 136; and by multiplying $5\frac{1}{8}$ by 40, the result is 205. Hence, $\frac{3\frac{2}{5}}{5\frac{1}{8}} = \frac{136}{205}$.

Problems

Change the following complex fractions to simple fractions:

1. $\frac{2\frac{1}{3}}{3\frac{3}{4}}$ 2. $\frac{5\frac{1}{2}}{7\frac{1}{8}}$ 3. $\frac{6\frac{5}{8}}{8\frac{3}{4}}$ 4. $\frac{9\frac{2}{5}}{11\frac{4}{15}}$ 5. $\frac{12\frac{1}{2}}{18\frac{2}{3}}$

Addition of Fractions and Mixed Numbers

To add fractions having the same denominator.—

Example.—Add $\frac{3}{8}$ and $\frac{7}{8}$.

$$\frac{3}{8} + \frac{7}{8} = \frac{10}{8} = 1\frac{1}{4}$$

Thus, $\frac{3}{8} + \frac{7}{8} = \frac{10}{8}$. By changing the improper fraction $\frac{10}{8}$ to a mixed number, the result is $1\frac{2}{8}$, or $1\frac{1}{4}$.

When two fractions have the same denominator, they are added by adding the numerators.

Problems

1. $\frac{3}{7} + \frac{2}{7}$ 2. $\frac{5}{12} + \frac{7}{12}$ 3. $\frac{3}{16} + \frac{11}{16}$

4. $\frac{4}{22} + \frac{7}{22} + \frac{15}{22}$

To add fractions having different denominators.—

Example.—Add $\frac{2}{3}$, $\frac{3}{4}$, and $\frac{5}{6}$.

$$\frac{8+9+10}{12} = \frac{27}{12} = 2\tfrac{1}{4}$$

Thus, 12 is the least common denominator of the denominators 3, 4, and 6. By expressing each fraction in terms of the least common denominator we have $\frac{8}{12} + \frac{9}{12} + \frac{10}{12}$, and, by adding the numerators and placing the total over the common denominator, the result is $\frac{27}{12}$, or $2\frac{1}{4}$.

When the fractions to be added have different denominators, find the least common multiple of their denominators.

Problems

1. $\frac{3}{8} + \frac{7}{8}$
2. $\frac{5}{6} + \frac{11}{12}$
3. $\frac{8}{9} + \frac{7}{18}$
4. $\frac{3}{7} + \frac{1}{3}$
5. $\frac{2}{5} + \frac{7}{10} + \frac{9}{20}$
6. $\frac{2}{3} + \frac{4}{7} + \frac{5}{14}$

To find the sum of mixed numbers.–

Examples.—**1.** Add $3\frac{3}{4}$, $4\frac{2}{3}$ and $7\frac{1}{8}$.

$$\frac{18+16+3}{24} = \frac{37}{24} = 1\tfrac{13}{24}$$

$$3 + 4 + 7 + 1\tfrac{13}{24} = 15\tfrac{13}{24}$$

The common denominator is 24. The sum of the fractions, $1\frac{13}{24}$, plus the sum of the numbers, 14, equals $15\frac{13}{24}$.

2. Add $7\frac{1}{8}$, $8\frac{3}{16}$, $14\frac{5}{6}$, and $23\frac{7}{12}$.

$7\frac{1}{8}$	6	
$8\frac{3}{16}$	9	
$14\frac{5}{6}$	40	48
$23\frac{7}{12}$	28	
52	$\frac{83}{48}$	$= 1\frac{35}{48}$
$1\frac{35}{48}$		
$53\frac{35}{48}$		

The common denominator is 48. The sum of the fractions, $1\frac{35}{48}$, plus the sum of the numbers, 52, equals $53\frac{35}{48}$.

To find the sum of mixed numbers, add the fractions first and then add the sum of the fractions to the whole numbers.

Problems

1. $2\frac{2}{3} + 5\frac{1}{6} + 14\frac{7}{12}$
2. $4\frac{8}{9} + 7\frac{11}{36} + 28\frac{3}{4}$
3. $17\frac{7}{8} + 42\frac{9}{10} + 54\frac{3}{16}$
4. $29\frac{5}{7} + 34\frac{8}{21} + 72\frac{1}{6}$

Subtraction of Fractions and Mixed Numbers

To subtract common fractions.—

Example.—From $\frac{3}{5}$ take $\frac{5}{9}$.

$$\frac{27 - 25}{45} = \frac{2}{45}$$

The least common denominator of 5 and 9 is 45. By expressing each fraction in terms of the least common denominator, we have $\frac{27}{45}$ and $\frac{25}{45}$. From the minuend, $\frac{27}{45}$, take the subtrahend, $\frac{25}{45}$. The result is $\frac{2}{45}$.

Problems

1. $\frac{8}{11} - \frac{5}{11}$
2. $\frac{7}{8} - \frac{3}{4}$
3. $\frac{15}{24} - \frac{3}{8}$
4. $\frac{19}{42} - \frac{3}{14}$
5. $\frac{29}{38} - \frac{14}{32}$
6. $\frac{15}{18} - \frac{13}{27}$
7. $\frac{43}{72} - \frac{3}{48}$
8. $\frac{15}{16} - \frac{21}{24}$

To subtract mixed numbers.—

Examples.—**1.** From $39\frac{5}{8}$ take $16\frac{7}{12}$.

$$\begin{array}{r|l} 39\frac{5}{8} & 15 \\ & \\ 16\frac{7}{12} & 14 \\ \hline 13 & \frac{1}{24} \\ \frac{1}{24} & \\ \hline 13\frac{1}{24} & \end{array} \Big| 24$$

2. From $137\frac{6}{21}$ take $93\frac{3}{7}$. Before $\frac{3}{7}$ or $\frac{9}{21}$ can be taken from $\frac{6}{21}$, it is necessary to borrow 1 or $\frac{21}{21}$ from the whole number in the minuend, and add it to the fraction in the minuend. Hence, $\frac{6}{21} + \frac{21}{21} = \frac{27}{21} - \frac{9}{21} = \frac{18}{21} = \frac{6}{7}$. By this operation the minuend becomes $136\frac{27}{21}$.

$$\begin{array}{r|l} 137\frac{6}{21} & 6 \\ & \\ 93\frac{3}{7} & 9 \\ \hline \end{array} \Big| 21$$

As changed

$$\begin{array}{r|l} 136\frac{27}{21} & 27 \\ & 21 \\ \hline 93\frac{3}{7} & 9 \\ \hline 43 & \frac{18}{21} = \frac{6}{7} \\ \frac{6}{7} & \\ \hline 43\frac{6}{7} & \end{array}$$

To subtract mixed numbers, find the difference between the two fractions, and then find the difference between the whole numbers. Place the results in position as shown in the illustration.

Problems

1. $24\frac{5}{6} - 13\frac{3}{4}$
2. $58\frac{7}{12} - 37\frac{5}{6}$
3. $77\frac{6}{22} - 49\frac{5}{8}$
4. $112\frac{1}{7} - 72\frac{4}{6}$
5. $89\frac{1}{9} - 38\frac{4}{5}$
6. $243\frac{3}{17} - 116\frac{2}{3}$

Multiplication of Fractions and Mixed Numbers

To multiply one common fraction by another.—*Example.*—Multiply $\frac{7}{8}$ by $\frac{9}{11}$.

$$\frac{7}{8} \times \frac{9}{11} = \frac{63}{88}$$

To multiply one common fraction by another common fraction, place the product of the numerators over the product of the denominators.

Problems

Shorten the process by cancellation when possible.

1. $\frac{3}{7} \times \frac{4}{9}$
2. $\frac{8}{11} \times \frac{9}{24}$
3. $\frac{7}{9} \times \frac{3}{32}$
4. $\frac{15}{16} \times \frac{1}{12}$
5. $\frac{13}{37} \times \frac{15}{44}$
6. $\frac{27}{29} \times \frac{17}{63}$

To multiply a common fraction by a whole number.—*Example.*—Multiply $\frac{3}{7}$ by 12.

$$\frac{3}{7} \times \frac{12}{1} = \frac{36}{7} = 5\frac{1}{7}$$

The whole number 12, when expressed as a fraction, is $\frac{12}{1}$. To multiply $\frac{3}{7} \times 12$, multiply $\frac{3}{7}$ by $\frac{12}{1}$. The result is $\frac{36}{7}$, or $5\frac{1}{7}$.

It makes no difference whether the fraction be the multiplier or the multiplicand; the result will be the same:

$$14 \times \tfrac{3}{9} = \tfrac{14}{1} \times \tfrac{3}{9} = \tfrac{42}{9} = 4\tfrac{6}{9} \text{ or } 4\tfrac{2}{3}$$

or

$$\tfrac{3}{9} \times 14 = \tfrac{3}{9} \times \tfrac{14}{1} = \tfrac{42}{9} = 4\tfrac{6}{9} \text{ or } 4\tfrac{2}{3}$$

Problems

1. $\frac{7}{12} \times 13$
2. $\frac{6}{7} \times 124$
3. $\frac{19}{72} \times 17$
4. $21 \times \frac{3}{7}$
5. $36 \times \frac{3}{8}$
6. $137 \times \frac{32}{43}$

To multiply one mixed number by another.—

Example.—Multiply $6\frac{3}{4}$ by $4\frac{1}{8}$.

$$6\tfrac{3}{4} = \tfrac{27}{4}$$
$$4\tfrac{1}{8} = \tfrac{33}{8}$$
$$\tfrac{27}{4} \times \tfrac{33}{8} = \tfrac{891}{32} = 27\tfrac{27}{32}$$

To multiply one mixed number by another mixed number, change the mixed numbers to improper fractions and multiply in the usual way, as illustrated.

The four-step process.—

Example.—Multiply $4\frac{3}{4}$ by $6\frac{1}{2}$.

$$\begin{array}{l} 4\frac{3}{4} \\ 6\frac{1}{2} \\ \hline \frac{3}{8} \\ 2 \\ 4\frac{1}{2} \\ 24 \\ \hline 30\frac{7}{8} \end{array} \qquad \begin{array}{l} \frac{1}{2} \times \frac{3}{4} = \frac{3}{8} \\ \frac{1}{2} \times 4 = 2 \\ 6 \times \frac{3}{4} = 4\frac{1}{2} \\ 6 \times 4 = 24 \end{array}$$

The four-step process, as illustrated, may be used when multiplying mixed numbers.

To multiply a mixed number and a common fraction.—

Examples.—

1. Multiply $\frac{3}{7}$ by $14\frac{7}{8}$.

$$\tfrac{3}{7} \times \tfrac{7}{8} = \tfrac{3}{8}$$
$$\tfrac{3}{7} \times 14 = \tfrac{42}{7} = 6$$
$$6 + \tfrac{3}{8} = 6\tfrac{3}{8}$$

Multiply the fractions together. $\frac{3}{7} \times \frac{7}{8} = \frac{3}{8}$. Multiply the whole number 14 by $\frac{3}{7}$, which gives 6. The result is $6\frac{3}{8}$.

2. Multiply $17\frac{8}{9}$ by $\frac{4}{5}$

$$\tfrac{8}{9} \times \tfrac{4}{5} = \tfrac{32}{45}$$
$$17 \times \tfrac{4}{5} = \tfrac{68}{5} = 13\tfrac{3}{5}$$
$$\tfrac{32}{45} + 13\tfrac{3}{5} = 14\tfrac{14}{45}$$

Proceed in the same way as in the preceding problem.

Problems

1. $4\frac{5}{8} \times 12\frac{7}{8}$	**3.** $21\frac{1}{7} \times 15\frac{1}{3}$	**5.** $31\frac{5}{6} \times 8\frac{7}{12}$
2. $9\frac{3}{4} \times 15\frac{2}{3}$	**4.** $24\frac{1}{5} \times 18\frac{1}{4}$	**6.** $44\frac{2}{9} \times 23\frac{5}{6}$

Division of Fractions and Mixed Numbers

To divide a common fraction by a whole number.—*Examples.*—

1. Divide $\frac{8}{9}$ by 4.

$$\frac{8}{9} \div 4 = \frac{8 \div 4}{9} = \frac{2}{9}$$

2. Divide $\frac{5}{7}$ by 3.

$$\frac{5}{7} \div 3 = \frac{5}{7 \times 3} = \frac{5}{21}$$

To divide a fraction by a whole number, divide its numerator or multiply its denominator by that number.

Problems

1. $\frac{4}{7} \div 2$	**3.** $\frac{7}{9} \div 5$	**5.** $\frac{8}{15} \div 3$
2. $\frac{5}{21} \div 5$	**4.** $\frac{3}{11} \div 6$	**6.** $\frac{9}{10} \div 4$

To divide a whole number by a fraction.—*Examples.*—

1. Divide 12 by $\frac{3}{8}$.

$$12 \div \tfrac{3}{8} = 12 \div 3 \times 8 = 32$$

or

$$12 \div \tfrac{3}{8} = 12 \times \tfrac{8}{3} = \tfrac{96}{3} = 32$$

2. Divide 13 by $\frac{5}{9}$.

$$13 \div \tfrac{5}{9} = 13 \times \tfrac{9}{5} = \tfrac{117}{5} = 23\tfrac{2}{5}$$

To divide a whole number by a fraction, divide the whole number by the numerator and multiply by the denominator; or invert the fraction, multiply the whole number by the numerator, and divide the product by the denominator.

Problems

1. $8 \div \frac{2}{5}$
2. $16 \div \frac{8}{9}$
3. $21 \div \frac{3}{7}$
4. $7 \div \frac{2}{3}$
5. $42 \div \frac{6}{7}$
6. $29 \div \frac{5}{6}$

To divide one common fraction by another.—

Example.—Divide $\frac{5}{7}$ by $\frac{3}{4}$.

$$\frac{5}{7} \div \frac{3}{4} = \frac{5}{7} \times \frac{4}{3} = \frac{20}{21}$$

To divide one common fraction by another, invert the divisor and multiply.

Problems

1. $\frac{3}{7} \div \frac{2}{3}$
2. $\frac{4}{9} \div \frac{3}{8}$
3. $\frac{8}{9} \div \frac{1}{6}$
4. $\frac{7}{12} \div \frac{5}{8}$
5. $\frac{5}{6} \div \frac{7}{10}$
6. $\frac{5}{9} \div \frac{7}{8}$

To divide one mixed number by another.—

Example.—Divide $8\frac{3}{5}$ by $2\frac{2}{3}$.

$$8\tfrac{3}{5} \div 2\tfrac{2}{3} = \tfrac{43}{5} \div \tfrac{8}{3} = \tfrac{43}{5} \times \tfrac{3}{8} = \tfrac{129}{40} = 3\tfrac{9}{40}.$$

To divide one mixed number by another, change the mixed numbers to improper fractions, invert the divisor and multiply.

To divide a mixed number by a whole number.—

Example.—Divide $9\frac{7}{8}$ by 4.

$$9\tfrac{7}{8} \div 4 = \tfrac{79}{8} \times \tfrac{1}{4} = \tfrac{79}{32} = 2\tfrac{15}{32}$$

To divide a mixed number by a whole number, change the mixed number to an improper fraction and divide the numerator or multiply the denominator by the whole number.

Another method to use when the dividend is a large number:

Example.—Divide $1242\frac{3}{8}$ by 8. Divide as in whole numbers and simplify the complex fraction remaining. To simplify the complex fraction $\frac{2\frac{3}{8}}{8}$, multiply 2 by 8 and add 3.

This equals 19 over (8×8) or $64 = \frac{19}{64}$.

$$8\overline{)1242\frac{3}{8}}$$

$$155\frac{2\frac{3}{8}}{8} = 155\frac{19}{64}$$

To divide a whole number by a mixed number.—

Example.—Divide 24 by $5\frac{4}{5}$.

$$24 \div 5\tfrac{4}{5} = 24 \div \tfrac{29}{5} = 24 \times \tfrac{5}{29} = \tfrac{120}{29} = 4\tfrac{4}{29}$$

To divide a whole number by a mixed number, change the mixed number to an improper fraction, invert, and multiply.

Another method of dividing whole and mixed numbers is as follows:

Examples.—

1. Divide $187\frac{3}{5}$ by 6.

$$6\overline{)187\frac{3}{5}}$$

$$31\frac{1\frac{3}{5}}{6} = 31\tfrac{8}{30}$$

2. Divide 392 by $24\frac{2}{5}$.

$$392 \div 24\tfrac{2}{5} = \frac{392 \times 5}{24\frac{2}{5} \times 5} = \frac{1960}{122} = 16\tfrac{48}{61}$$

3. Divide $844\frac{1}{3}$ by $38\frac{3}{4}$.

$$844\tfrac{1}{3} \div 38\tfrac{3}{4} = \frac{844\frac{1}{3} \times 12}{38\frac{3}{4} \times 12} = \frac{10132}{465} = 21\tfrac{367}{465}$$

Multiply both the dividend and the divisor by 12, the lowest common multiple of the denominators.

4. Divide $38\frac{5}{6}$ by $7\frac{2}{3}$.

$$38\tfrac{5}{6} \div 7\tfrac{2}{3} = \frac{38\frac{5}{6} \times 6}{7\frac{2}{3} \times 6} = \frac{233}{46} = 5\tfrac{23}{46}$$

Problems

1. $8\frac{4}{9} \div 2\frac{2}{3}$	**4.** $24\frac{2}{3} \div 5$	**7.** $38 \div 3\frac{3}{4}$
2. $12\frac{5}{6} \div 3\frac{3}{4}$	**5.** $36\frac{6}{7} \div 7$	**8.** $48 \div 6\frac{1}{7}$
3. $18\frac{1}{4} \div 3\frac{5}{8}$	**6.** $72\frac{4}{5} \div 9$	**9.** $96 \div 15\frac{7}{12}$

Review Problems

1. $\frac{3}{4} + \frac{2}{5} + \frac{6}{7}$
2. $\frac{5}{9} \times \frac{2}{3} \times \frac{1}{2}$
3. $2\frac{1}{2} \times \frac{3}{8} - \frac{2}{3}$
4. $\frac{7}{12} + \frac{5}{8} \div \frac{3}{4}$
5. $312\frac{1}{4} \times 6\frac{3}{4}$
6. $672\frac{7}{8} \div 44\frac{1}{4}$
7. $296\frac{5}{9} \div 35$
8. $574 \div 27\frac{3}{8}$
9. $34\frac{1}{4} \times 52\frac{5}{8} \div 31\frac{1}{3}$
10. $\frac{7}{12} \times 72\frac{1}{8} + 28\frac{3}{4}$

General Problems

1. A man spent $\frac{1}{4}$ of his salary for room and board, $\frac{1}{8}$ for clothes, and $\frac{1}{16}$ for incidental expenses. (a) How much did he spend for each item if his salary was \$3200 a year? (b) How much did he save?

2. *A* can do a piece of work in 8 days and *B* can do the same piece of work in 10 days. What part of the work can they do in one day when working together?

3. A man sold $\frac{3}{8}$ of a tract of land containing 240 acres. How many acres remained unsold?

4. A house and the lot on which it stands are worth \$12,000. The house is worth 3 times as much as the land. How much is each worth?

5. If coffee loses $\frac{1}{6}$ of its weight in roasting, how many pounds of green coffee will be necessary to make 1800 lb. when roasted?

6. A man sold $\frac{1}{3}$ of his interest in a business for \$6000. (a) If he owned $\frac{5}{6}$ of the business, what part of the whole did he sell? (b) What was the business worth at this rate?

7. A dealer bought 8 bu. of onions for \$2.50 a bushel. However, he found that $\frac{1}{2}$ bu. were decayed. He sold the good onions at a profit of \$6.25 on the whole cost. How much did he get per bushel for them?

8. A merchant bought a quantity of cloth for \$2432. By selling it at \$3.80 a yard, he gained $\frac{1}{4}$ of the cost. How many yards did he buy?

DECIMAL FRACTIONS

A **decimal fraction** is expressed in tenths, hundredths, thousandths, and so forth.

In writing decimal fractions, the denominator is not used as in writing common fractions; instead, it is indicated by means of a decimal point. Thus, one tenth ($\frac{1}{10}$) is written .1; seven tenths ($\frac{7}{10}$) is written .7; eight hundredths ($\frac{8}{100}$) is

written .08; twenty-three hundredths ($\frac{23}{100}$) is written .23; fifteen thousandths ($\frac{15}{1000}$) is written .015, and three hundred seventy-five thousandths ($\frac{375}{1000}$) is written .375.

To express tenths one place is pointed off, as in .8.

To express hundredths two places are pointed off, as in .37.

To express thousandths three places are pointed off, as in .675.

To express ten-thousandths four places are pointed off, as in .4265 or .0045.

The number of figures in a decimal and the number of ciphers in its denominator are the same. Thus, $\frac{225}{1000}$ is written .225.

The value of a decimal fraction is not changed by annexing or omitting ciphers on the right. Thus, $\frac{2}{10} = \frac{20}{100} = \frac{200}{1000}$. Also, .2 = .20 = .200.

Moving the decimal point one place to the left divides the decimal by 10; two places divides it by 100; three places divides it by 1000, and so forth. Likewise, moving the decimal point one place to the right multiplies the decimal by 10; two places by 100; three places by 1000, and so forth.

Decimals are classified as simple and complex.

A **simple decimal** has a whole number written to the right of the decimal point; as .75, .245, .0372.

A **complex decimal** has a whole number and a common fraction written to the right of the decimal point; as $.03\frac{1}{8}$, $.375\frac{6}{7}$, $.1389\frac{4}{5}$.

Problems

Write the following decimals, using figures:

1. Three tenths. Eight tenths.
2. Five hundredths. Sixty-five hundredths.
3. One hundred twenty-five thousandths.
4. Three and three-eighths hundredths.
5. Twenty-five and five-sixths thousandths.

To change a common fraction to a decimal.—

Examples.—

1. Change $\frac{3}{8}$ to a decimal.

$$
\begin{array}{r}
.375 \\
8\overline{)3.000} \\
24 \\
\hline
60 \\
56 \\
\hline
40
\end{array}
$$

2. Change $\frac{4}{7}$ to a decimal.

$$
\begin{array}{r}
.571\frac{3}{7} \\
7\overline{)4.000} \\
35 \\
\hline
50 \\
49 \\
\hline
10 \\
7 \\
\hline
3
\end{array}
$$

By annexing two ciphers, the result is $.57\frac{1}{7}$; three ciphers, $.571\frac{3}{7}$, etc. When the result is a complex decimal, two places are usually far enough to carry out the decimal.

3. Change $\frac{5}{9}$ to a decimal.

$$
\begin{array}{r}
.5555 \\
9\overline{)5.0000} \\
45 \\
\hline
50 \\
45 \\
\hline
50 \\
45 \\
\hline
5
\end{array}
$$

For most purposes an approximate result, from carrying the decimal out three or four places, is all that is necessary.

To change a common fraction to a decimal, annex ciphers to the numerator and divide by the denominator.

Problems

Change the following fractions to decimals:

1. $\frac{3}{4}$ **2.** $\frac{5}{8}$ **3.** $\frac{9}{16}$ **4.** $\frac{7}{8}$ **5.** $\frac{15}{16}$

To extend a complex decimal.—

Where the division comes out even, the fraction is removed; otherwise the decimal may be extended as many extra places as are desired.

Example.—

Extend the complex decimal $.6\frac{3}{8}$ to four decimal places.

$$.6\tfrac{3}{8} = .6375$$

$$\begin{array}{r} .375 \\ 8\overline{)3000} \\ 24 \\ \hline 60 \\ 56 \\ \hline 40 \end{array}$$

By annexing ciphers to the numerator of the fraction and dividing by the denominator, the result is 375, and by writing the decimal .6375 instead of $6\frac{3}{8}$, its value is not changed.

A complex decimal may be extended by adding ciphers to the numerator of the fraction and dividing by the denominator.

Problems

Extend the following complex decimals:

1. $.7\frac{5}{8}$ to 3 places
2. $.41\frac{7}{8}$ to 5 places
3. $.5\frac{1}{16}$ to 5 places
4. $.17\frac{5}{12}$ to 6 places

Addition of Decimals

To add whole numbers and simple decimals.—

Example.—

$$\begin{array}{r} 3.75 \\ 14.125 \\ 37.8 \\ 54.375 \\ 3.25 \\ \hline 113.300 \end{array}$$

To add whole numbers and decimals, place the numbers in columns so that the decimal points are directly under each other, and add in the usual way. Place the decimal point in the result directly under the points in the numbers added.

Problems

Add:

1. 6.375, 5.8, 21.425, 13.4 and 51.75
2. 37.5, 54.125, 57.025, 3.2875 and 14.6

To add whole numbers and complex decimals.—

Examples.—

1.

$37.42\frac{1}{2}$	change to		37.422
$15.7\frac{3}{4}$	"	"	15.775
$125.3\frac{7}{8}$	"	"	125.3875
$29.087\frac{1}{4}$	"	"	29.08725
			207.67175

2.

$12.3\frac{1}{3}$ change to $12.3333\frac{1}{3}$
$17.85\frac{1}{6}$ " " $17.8616\frac{2}{3}$
$375.9\frac{3}{9}$ " " $375.9333\frac{3}{9}$
$54.08\frac{2}{3}$ " " $54.0866\frac{2}{3}$
$460.2148\frac{1}{9}\frac{8}{}$, or 460.215.

Carry out the extensions the same number of places in each case, so that the fractions not removed will come directly under each other; then proceed to add in the usual way.

To add whole numbers and complex decimals, extend the complex decimal until the fractions are removed or the decimals are extended the same number of places; and then add in the usual way. Place the result in position.

Problems

1. $3.7\frac{1}{8}$, $14.3\frac{7}{8}$, $23.66\frac{3}{4}$ and $51.28\frac{3}{5}$

2. $8.11\frac{1}{3}$, $73.84\frac{1}{6}$, $67.025\frac{1}{2}$ and $9.03\frac{1}{12}$

3. $37.92\frac{2}{3}$, $43.08\frac{3}{2}\frac{}{5}$, $12.69\frac{1}{6}$ and $93.42\frac{5}{8}$

Subtraction of Decimals

To subtract simple decimals.—

Example.—From 29.43 take 11.1675.

$$\begin{array}{r} 29.43 \\ 11.1675 \\ \hline 18.2625 \end{array}$$

Place the decimal points directly under each other and subtract as in subtracting mixed numbers. Place the decimal point in the remainder directly under the points in the minuend and in the subtrahend.

Problems

1. $38.725 - 17.93$ **2.** $128.46 - 39.375$ **3.** $117.087 - 92.675$
4. $198.125 - 137.8625$ **5.** $3 - .4785$

To subtract a simple decimal and a complex decimal.—

Examples.—

1. From $37.5\frac{1}{8}$ take 12.375.

$37.5\frac{1}{8} = 37.512\frac{1}{2}$
12.375
$25.137\frac{1}{2}$
or 25.1375

2. From $49.3\frac{1}{16}$ take $31.57\frac{2}{15}$.

$$\begin{aligned} 49.3\tfrac{1}{16} &= 49.3062\tfrac{1}{2} \\ 31.57\tfrac{2}{15} &= 31.5713\tfrac{1}{3} \\ \hline & 17.7349\tfrac{1}{6} \end{aligned}$$

Extend the shorter complex decimal until the fraction is removed or until there are as many places to the right of the decimal point in the minuend as there are places to the right of the decimal point in the subtrahend, and then subtract in the usual way.

Problems

1. $78.6\frac{5}{6} - 23.34\frac{1}{4}$

2. $6.33\frac{5}{12} - 2.5\frac{1}{8}$

3. $7.7\frac{3}{8} - 3.23\frac{5}{16}$

4. $4.78\frac{1}{3} - 1.24\frac{1}{12}$

Multiplication of Decimals

To multiply simple decimals.—

Example.—Multiply .34 by .4.

$$\begin{array}{r} .34 \\ .4 \\ \hline .136 \end{array} \quad \text{or} \quad \frac{34}{100} \times \frac{4}{100} = \frac{136}{1000} = .136$$

To multiply one simple decimal by another simple decimal, multiply in the usual way and point off as many places in the product as there are places pointed off in both the multiplicand and the multiplier.

Problems

1. 38.375×12.75

2. 17.3125×3.8

3. 44.15×2.3725

4. 11.21×8.7625

To simplify the process, the multiplier and the multiplicand may be interchanged.

To multiply complex decimals.—

Example.—Multiply $23.7\frac{1}{2}$ by $7.34\frac{7}{8}$.

$$\begin{aligned} 23.7\tfrac{1}{2} &= 23.75 \\ 7.34\tfrac{7}{8} &= 7.34875 \end{aligned}$$

$$\begin{array}{r} 7.34875 \\ 23.75 \\ \hline 3674375 \\ 5144125 \\ 2204625 \\ 1469750 \\ \hline 174.5328125 \end{array}$$

or

$$23.7\tfrac{1}{2} \times 7.34\tfrac{7}{8} =$$
$$\frac{47.5}{2} \times \frac{58.79}{8} =$$
$$\frac{2792.525}{16} = 174.532\tfrac{13}{16}$$

In multiplying complex decimals, where the fraction can be removed by extending the decimal, this may be done; or, the complex decimals may be changed, as mixed numbers are changed, to improper fractions.

Problems

1. $7.52\frac{1}{6} \times 3.4\frac{1}{3}$

2. $5.735 \times .08\frac{1}{3}$

3. $3.48\frac{1}{12} \times .32\frac{5}{6}$

4. $.637\frac{1}{4} \times 2.34\frac{1}{8}$

Division of Decimals

To divide one simple decimal by another.—

Examples.—

1. Divide 54.4625 by .65.

$$.65\overline{)54.4625} = 83.78\tfrac{11}{13}$$

Divide in the usual way, and point off as many places in the quotient as those in the dividend exceed those in the divisor. (In this problem four places are pointed off in the dividend and two places in the divisor. Hence, two places are pointed off in the quotient.)

2. Divide 48.75 by 4.5.

$$48.75 \times 100 = 4875$$
$$4.5 \times 100 = 450$$
$$4875 \div 450 = 10.83\tfrac{1}{3}$$

Multiplying both the dividend and the divisor by 100 does not change the quotient. The division can be simplified by moving the decimal points in both the dividend and divisor to the right as many places as are necessary to make the divisor a whole number, and then dividing.

Problems

1. $535.65 \div 15.5$
2. $.8575 \div 125$
3. $78.425 \div 6.25$
4. $37.625 \div 5.375$

To divide one complex decimal by another.—

Example.—Divide $325.66\frac{2}{3}$ by $5.3\frac{1}{3}$.

$$325.66\tfrac{2}{3} \times 3 = 677.00 \qquad 5.3\tfrac{1}{3} \times 3 = 16.0$$

$$16 \overline{)677} \quad 42\tfrac{5}{16}$$

$$64$$

$$37$$

$$32$$

$$\tfrac{5}{16}$$

In the division of complex decimals, change the complex decimals to simple decimals if possible and then divide; otherwise, multiply both numbers by the lowest common multiple of the denominators of the common fractions before dividing. (See the illustration.)

Problems

1. $84.36\frac{1}{4} \div 4.3\frac{1}{2}$
2. $128.56\frac{5}{6} \div 3.2\frac{2}{3}$
3. $375.25\frac{3}{8} \div 25.12\frac{1}{4}$
4. $88.44 \div 3.6\frac{1}{4}$
5. $482.18\frac{2}{3} \div 4.16\frac{1}{3}$
6. $68.33\frac{1}{3} \div 1.03\frac{1}{3}$

General Problems

1. A man has .25 of his money invested in U. P. R. R. stock, .15 in farm mortgages, .35 in corporation bonds, and the remainder deposited in a savings bank. If he has $4000 in the bank, how much has he invested in (a) U. P. R. R. stock? (b) Farm mortgages? (c) Corporation bonds?

2. *A* invested .34 of the capital invested in a business, *B* invested .42, and *C* invested $12,000. (a) How much was the capital of the firm? (b) How much did *A* and *B* each invest?

3. A farmer exchanged 6240 lb. of potatoes worth $1.45 per bu. (each bu. weighing 60 lb.) for 8000 lb. of fertilizer. What was the price of the fertilizer per 100 lb.? (This problem can be solved by cancellation.)

4. The expenses of operating a delivery equipment for one year were $28,800. The expenses were divided as follows: gas and oil, 14.2 hundredths; repairs, 8.5 hundredths; wages of drivers, 48.8 hundredths; replacements, tires and accessories, 8.5 hundredths; and the remainder was charged

to depreciation. (a) What was the amount of depreciation? (b) Find the amount of each item of expense.

5. In a certain city with a population of 66,320, there were 22,683 voters. Find to the nearest thousandth what decimal part of the whole population the voters comprise.

ALIQUOT PARTS

An **aliquot part** of a number is a part that will be contained in that number without leaving a remainder. Thus, $2\frac{1}{2}$ is an aliquot part of 10; 25 is an aliquot part of 100; $33\frac{1}{3}$ is an aliquot part of 100.

An aliquot part of a number is any multiple of an exact divisor of that number. Thus, $66\frac{2}{3}$ is an aliquot part of 100, or twice $\frac{1}{3}$ $(33\frac{1}{3})$, which is also an aliquot part of 100.

The aliquot parts of 100, such as halves, thirds, fourths, fifths, sixths, eighths, twelfths, and sixteenths, are the most commonly used in business. Sevenths and ninths are also used to some extent.

Table of Aliquot Parts

The following table contains the most common parts of $1.00 or 100, and should be carefully studied:

Halves: $(\frac{1}{2}, .50)$.

Thirds: $(\frac{1}{3}, .33\frac{1}{3})$; $(\frac{2}{3}, .66\frac{2}{3})$.

Fourths: $(\frac{1}{4}, .25)$; $(\frac{2}{4}, .50)$; $(\frac{3}{4}, .75)$.

Fifths: $(\frac{1}{5}, .20)$; $(\frac{2}{5}, .40)$; $(\frac{3}{5}, .60)$; $(\frac{4}{5}, .80)$.

Sixths: $(\frac{1}{6}, .16\frac{2}{3})$; $(\frac{2}{6}, .33\frac{1}{3})$; $(\frac{3}{6}, .50)$; $(\frac{4}{6}, .66\frac{2}{3})$; $(\frac{5}{6}, .83\frac{1}{3})$.

Eighths: $(\frac{1}{8}, .12\frac{1}{2})$; $(\frac{2}{8}, .25)$; $(\frac{3}{8}, .37\frac{1}{2})$; $(\frac{4}{8}, .50)$; $(\frac{5}{8}, .62\frac{1}{2})$; $(\frac{6}{8}, .75)$; $(\frac{7}{8}, .87\frac{1}{2})$

Twelfths: $(\frac{1}{12}, .08\frac{1}{3})$; $(\frac{2}{12}, .16\frac{2}{3})$; $(\frac{3}{12}, .25)$; $(\frac{4}{12}, .33\frac{1}{3})$; $(\frac{5}{12}, .41\frac{2}{3})$; $(\frac{6}{12}, .50)$; $(\frac{7}{12}, .58\frac{1}{3})$; $(\frac{8}{12}, .66\frac{2}{3})$; $(\frac{9}{12}, .75)$; $(\frac{10}{12}, .83\frac{1}{3})$; $(\frac{11}{12}, .91\frac{2}{3})$.

Sixteenths: $(\frac{1}{16}, .06\frac{1}{4})$; $(\frac{2}{16}, .12\frac{1}{2})$; $(\frac{3}{16}, .18\frac{3}{4})$; $(\frac{4}{16}, .25)$; $(\frac{5}{16}, .31\frac{1}{4})$; $(\frac{6}{16}, .37\frac{1}{2})$; $(\frac{7}{16}, .43\frac{3}{4})$; $(\frac{8}{16}, .50)$; $(\frac{9}{16}, .56\frac{1}{4})$; $(\frac{10}{16}, .62\frac{1}{2})$; $(\frac{11}{16}, .68\frac{3}{4})$; $(\frac{12}{16}, .75)$; $(\frac{13}{16}, .81\frac{1}{4})$; $(\frac{14}{16}, .87\frac{1}{2})$; $(\frac{15}{16}, .93\frac{3}{4})$.

Sevenths and ninths are sometimes used:

Sevenths: $(\frac{1}{7}, .14\frac{2}{7})$; $(\frac{2}{7}, .28\frac{4}{7})$; $(\frac{3}{7}, .42\frac{6}{7})$; $(\frac{4}{7}, .57\frac{1}{7})$; $(\frac{5}{7}, .71\frac{3}{7})$; $(\frac{6}{7}, .85\frac{5}{7})$.

Ninths: $(\frac{1}{9}, .11\frac{1}{9})$; $(\frac{2}{9}, .22\frac{2}{9})$; $(\frac{3}{9}, .33\frac{1}{3})$; $(\frac{4}{9}, .44\frac{4}{9})$; $(\frac{5}{9}, .55\frac{5}{9})$; $(\frac{6}{9}, .66\frac{2}{3})$; $(\frac{7}{9}, .77\frac{7}{9})$; $(\frac{8}{9}, .88\frac{8}{9})$.

To prove an aliquot part.—

Example.—

$\frac{8}{9} = .88\frac{8}{9}$

$.88\frac{8}{9} = \frac{800}{9}$

$\frac{800}{9} \div \frac{8}{9} = \frac{800}{9} \times \frac{9}{8} = \frac{800}{8} = 100$

$88\frac{8}{9} = \frac{8}{9}$

$88\frac{8}{9} = 8 \times \frac{1}{9}$

$\frac{1}{9} = \frac{1}{8} \times 88\frac{8}{9} = 11\frac{1}{8}$

$\frac{8}{8} = 9 \times 11\frac{1}{8} = 100$

How to Use Aliquot Parts

1. Aliquot parts can be used in finding the cost of commodities sold by the yard, pound, gallon, bushel, and like measures.

Example.—What is the cost of 69 yards of cloth at $16\frac{2}{3}¢$ a yard?

$16\frac{2}{3}¢ = \frac{1}{6}$ of \$1

$\frac{1}{6}$ of 69 = \$11.50

The price per yard, $16\frac{2}{3}¢$, is $\frac{1}{6}$ of \$1. At \$1 a yard, 69 yards would cost \$69, but at $\frac{1}{6}$ of \$1 a yard they would cost $\frac{1}{6}$ of \$69, or \$11.50.

Problems of this type can be solved mentally. Consider the articles as costing \$1 each and take such a fractional part of this amount as the aliquot part is of \$1.

The number of articles and the price can be interchanged as a means of simplifying the problem. Thus, $83\frac{1}{3}$ yd. at \$2.55 can be changed to 255 yd. at $\$.83\frac{1}{3}$.

Problems

1. Find the cost of 366 pounds at $8\frac{1}{3}¢$ a pound.
2. Find the cost of 412 gallons at $62\frac{1}{2}¢$ a gallon.
3. Find the cost of 393 yards at $66\frac{2}{3}¢$ a yard.
4. Find the cost of 843 bushels at $83\frac{1}{3}¢$ a bushel.
5. Find the cost of $87\frac{1}{2}$ pounds at \$1.28 a pound.

Find the cost of each item mentally, and find the total:

6.	7.	8.
12 yd. @ 25¢	56 lb. @ $12\frac{1}{2}$¢	48 yd. @ $18\frac{3}{4}$¢
32 yd. @ 75¢	64 lb. @ $37\frac{1}{2}$¢	64 yd. @ $6\frac{1}{4}$¢
36 yd. @ 50¢	48 lb. @ $62\frac{1}{2}$¢	80 yd. @ $43\frac{3}{4}$¢
28 yd. @ 25¢	96 lb. @ $33\frac{1}{3}$¢	96 yd. @ $56\frac{1}{4}$¢
40 yd. @ 75¢	72 lb. @ $66\frac{2}{3}$¢	108 yd. @ $83\frac{1}{3}$¢

9.	10.	11.
54 yd. @ $33\frac{1}{3}$¢	96 yd. @ $91\frac{2}{3}$¢	$16\frac{2}{3}$ lb. @ 54¢
72 yd. @ $16\frac{2}{3}$¢	66 yd. @ $41\frac{2}{3}$¢	$83\frac{1}{3}$ lb. @ 72¢
84 yd. @ $66\frac{2}{3}$¢	124 yd. @ $37\frac{1}{2}$¢	$58\frac{1}{3}$ lb. @ 66¢
24 yd. @ $8\frac{1}{3}$¢	78 yd. @ $16\frac{2}{3}$¢	$31\frac{1}{4}$ lb. @ 80¢
68 yd. @ $43\frac{3}{4}$¢	132 yd. @ $8\frac{1}{3}$¢	$62\frac{1}{2}$ lb. @ 96¢
64 yd. @ $56\frac{1}{4}$¢	112 yd. @ $31\frac{1}{4}$¢	$18\frac{3}{4}$ lb. @ $1.28

2. Aliquot parts are most used in figuring bills; inventories; and discounts such as $12\frac{1}{2}\%$, $33\frac{1}{3}\%$, and the like. Sometimes wage scales are such that aliquot parts can be used in figuring pay rolls, either by the hour or by piece-work.

Problem

12. Find the amount of the following bill. Prepare the same in correct form, as illustrated, showing the correct amounts and the total:

New York, N. Y., Oct. 23, 1928

JOHN H. MANNING
DENVER, COL.

Bought of CARPENTER & MOORE
398 BROADWAY

Terms: 5/10, n/60.

228 yd.	Unbleached Muslin	@	$12\frac{1}{2}$¢		
312 yd.	Cheesecloth	@	$6\frac{1}{4}$¢		
448 yd.	Anderson Gingham	@	$43\frac{3}{4}$¢		
864 yd.	Imported Prints	@	$16\frac{2}{3}$¢		
576 yd.	Cambric Lining	@	$8\frac{1}{3}$¢		
688 yd.	Outing Flannel	@	$18\frac{3}{4}$¢		

3. Aliquot parts can be used in finding the cost of commodities sold by the hundred (C), by the thousand (M), and by the ton (2000 lb.).

Example.—Find the cost of 2500 bd.-ft. (board feet) of Georgia pine sheathing at $42.00 per thousand board feet[1] (M).

2500 ft. = $2\frac{1}{2}$ M
$2\frac{1}{2}$ M × $42 = $105
1250 ft. = $1\frac{1}{4}$ M; 1750 ft. = $1\frac{3}{4}$ M; 2500 ft. = $2\frac{1}{2}$ M

The method of finding cost of lumber can be shortened wherever the number of feet can be changed to thousands, as illustrated.

The method can be shortened where the price per M is an aliquot part and can be used as such, as $31.25, $37.50, $43.75, $56.25, $62.50.

Example.—

Find the cost of 3240 bd.-ft. at 62.50 per M.

3240 ft. at $100 per M[2]	= $324
$324 × $\frac{5}{8}$ (62.50 = $\frac{5}{8}$ of 100)	= $202.50
$\frac{1}{8}$ or $12.50 per M	= $40.50
$\frac{5}{8}$ = 5 × $40.50	= $202.50, the cost

Problems

Find the cost of:

1. 4800 ft. of flooring @ $81.25 per M.
2. 2460 ft. of siding @ $62.50 per M.
3. 5600 ft. of sheathing @ $43.75 per M.
4. 2080 ft. of shelving @ $87.50 per M.

Examples.—**1.** Find the cost of 3500 lb. of feed at $9.60 per ton.

1 ton	= 2000 lb.
3500 pounds	= $1\frac{3}{4}$ tons
1 T. costs	$ 9.60
$\frac{3}{4}$ T. costs	$ 7.20
$1\frac{3}{4}$ T. costs	$ 16.80

[1] A board foot is 12 inches (1 ft.) long, 12 inches (1 ft.) wide, and 1 inch thick.
[2] $100 per M is 10¢ per foot (3240 × 10¢ = $324.00).

2. Find the cost of 1840 pounds of hay at $15 per ton.

$15 per ton = 75¢ per 100 lb.
At 1¢ a pound ($1 per 100 lb.), 1840 lb. costs $18.40.
75¢ = $\frac{3}{4}$ of 100¢.
$18.40 × $\frac{3}{4}$ = $13.80, the cost of 1840 pounds at $15 per ton.

Problems

1. Find the cost of:

1600 lb. @ $12.50 per ton	960 lb. @ 81¼¢ per cwt.
2250 lb. @ $16.00 per ton	1280 lb. @ 87½¢ per cwt.
3000 lb. @ $18.00 per ton	2460 lb. @ 41⅔¢ per cwt.
1250 lb. @ $24.00 per ton	1890 lb. @ 66⅔¢ per cwt.

Prepare a form. Copy the inventory items as illustrated and make the extensions. Note.—Pupils should exchange papers and check each other's work.

2. Make the extensions indicated in the following inventory:

INVENTORY No. 16 No. 16

DEPARTMENT: DRESS GOODS

DATE: JULY 1, 19—

Called by..... Priced by..... Checked by

Listed by..... Figured by..... .....

Stock No.		*Quantity*	*Cost*	*Per*	*Amount*	*Verification*
P482	Plain Percale.....	724	$ .12½	yd.		
T762	Tweed Prints.....	816	.33⅓	yd.		
PP68	Pattern Prints.....	648	.16⅔	yd.		
TF77	Tub Foulard.....	280	.87½	yd.		
PC94	Pastoral Cloth.....	960	.37½	yd.		
LC88	L. Charmeuse.....	1284	.91⅔	yd.		
SS121	S. Sateen.....	840	.83⅓	yd.		
PG117	P. G. Pongee.....	396	1.25	yd.		
FG73	F. Gingham.....	576	.41⅔	yd.		
AG274	A. Gingham.....	336	.31¼	yd.		
RV92	R. Voile.....	288	.93¾	yd.		
IT116	Irish Poplin.....	208	.68¾	yd.		
L224	Linene.....	216	.58⅓	yd.		
TC56	R. Flat Crepe.....	468	.75	yd.		
CC37	Canton Crepe.....	400	.81¼	yd.		
	CARRIED FORWARD..					

3. Complete the following inventory, and find the totals:

HENRY HOWARD FURNITURE COMPANY

PERPETUAL STOCK RECORD

Furniture Department

From June 1, to August 1, 19.. .....Stock Check

Article	*No.*	*On Hand*	*Rec.*	*Sold*	*On Hand*	*Rec.*	*Sold*	*On Hand*	*Price*	*Amt.*	*Ck.*
D. Chairs....	41	72	48	60		36	42		$ 4.20		
R. Chairs....	124	8	6	5		6	8		9.40		
E. Chairs....	317	6	4	5		4	6		11.90		
D. Tables....	115	7	6	8		6	4		28.75		
L. Tables....	171	4	6	3		4	5		18.80		
G. L. Tables....	148	5	6	4		3	5		15.50		
C. Tables....	121	4	4	3		3	4		9.40		
T. Tables....	311	5	4	5		6	3		23.20		
D. Beds....	46	4	3	2		3	5		31.25		
D. Beds....	58	6	4	5		3	2		41.25		
D. Beds....	37	5	4	3		3	6		44.50		
V. Couches....	119	4	3	5		4	2		51.75		
M. H. Couches....	124	5	4	6		9	5		88.85		
L. Couches....	188	6	3	5		4	3		92.50		
W. Beds....	390	4	3	5		6	4		32.25		
B. Beds....	412	6	4	3		6	7		28.75		
I. Beds....	577	8	6	7		9	8		18.75		
I. Beds....	588	9	6	5		9	11		16.50		
I. Beds....	537	12	9	14		12	13		12.50		
TOTAL....											

SHIPPING

Shipping by Parcel Post

Domestic postage rates are as follows:

First Class: Letters (written and sealed matter), 2¢ for each ounce.

Second Class: Newspapers, magazines, and other periodicals, 2¢ for each 2 ounces up to 8 ounces, and fourth-class zone rates plus 2¢ service charge on each parcel over 8 ounces.

Third Class: Circulars and other miscellaneous printed matter, also merchandise, $1\frac{1}{2}$¢ for each 2 ounces; limit, 8 ounces. Books, catalogs, seeds, bulbs, etc., 1¢ for each 2 ounces.

Fourth Class: Parcel Post Rates: Merchandise, books, printed matter, and all other mailable matter, over 8 ounces, not in first or second class.

Zone Rate Schedules

Zone rates,[1] including 2¢ service charges, are as follows:

Zone	*Distance*	*Rate*	*Rate for Additional Pounds*
Local	.....	7¢	1¢ each 2 pounds
1	Up to 50 miles	7¢	1¢ each pound
2	50 miles to 100 miles	7¢	1¢ each pound
3	150 miles to 300 miles	8¢	2¢ each pound
4	300 miles to 600 miles	9¢	4¢ each pound
5	600 miles to 1000 miles	10¢	6¢ each pound
6	1000 miles to 1400 miles	11¢	8¢ each pound
7	1400 miles to 1800 miles	13¢	10¢ each pound
8	Over 1800 miles.....	14¢	12¢ each pound

Limit of size: 84 inches in length and girth.

Limit of weight: 70 pounds in zones 1, 2 and 3, and 50 pounds in all others. A fraction of a pound is counted as another pound.

Insurance rates: For a valuation up to and not exceeding $5, the fee is 5¢; above $5 and not exceeding $25, 8¢; above $25 and not exceeding $50, 10¢; above $50 and not exceeding $100, 25¢.

Returned receipts for domestic insured parcels may be obtained upon request and payment of 3¢ for each receipt.

Air mail: For the first ounce or fraction, 5¢; each additional ounce or fraction, 10¢.

Any kind of mail of any value may be sent by Air Mail. It may be registered or sent by special delivery.

C. O. D. rates: 10¢ for amounts not to exceed $50 and 25¢ for amounts up to $100.[2]

[1] These rates are subject to change by an act of Congress.

[2] For latest information and rates, see "Postal Information," a paper-covered booklet published by the Post Office Department and distributed free through the different local post offices.

Calculating Parcel Post Charges

Example.—Find the cost of sending a package, valued at $50 and weighing 8 pounds, into the fourth zone.

1 pound	9¢
7 pounds @ 4¢	28¢
Insurance	10¢
Total	47¢

The rate is 9¢ for the first pound and 4¢ a pound for each additional pound. The insurance rate is 10¢ for $50 valuation.

Problems

1. A package weighing 10 pounds was sent, insured, into the sixth zone. How much was the postage?

2. A merchant desires to send 15 packages weighing 5 pounds each into the third zone. Each package is insured for $25. What will be the total cost of postage and insurance?

3. The cost of sending a package weighing 24 lb., and valued at $100, was $2.23 for postage and insurance. Into what zone was it sent?

4. A package weighing 12 lb. and valued at $50 was received. The postage and insurance paid amounted to $1.33. What was the zone rate?

5. Find the total cost of postage and insurance on the following shipments sent out by a mail order house:

No. Packages	*Weight*	*Value*	*Zone*
112 packages	7 pounds each	$ 25 each	2nd zone
88 packages	12 pounds each	$ 50 each	4th zone
160 packages	21 pounds each	$ 25 each	5th zone
207 packages	14 pounds each	$100 each	7th zone

Shipping by Freight

In shipping by freight, as in shipping by express (see p. 53), there are many different terms and classifications of rates, of territories, and of articles offered for shipment with which one who does much shipping should become familiar.

The terms peculiar to freight shipments, as in the case of express shipments, are: consignor, consignee, bill of lading,

way bill, freight rate, commodity rate, class rate, freight bill, territory classification, freight classification and freight tariff.

The **consignor** is one who ships something.

The **consignee** is the one to whom something is shipped.

The **bill of lading** is a document issued in triplicate by which a railroad or transportation company acknowledges the receipts of goods to be shipped. It contains shipping directions and an agreement on the part of the railroad to deliver the goods to the consignee.

Bills of lading are issued by means of carbon paper in sets of three. The first copy is called the **original;** the second copy, the **shipping order,** and the third copy, the **memorandum.** The original is signed by the agent for the railroad and by the consignor, and is sent to the consignee. The shipping order is signed by the consignor and is retained by the agent for the railroad. The memorandum is signed by the agent for the railroad and by the consignor, and is kept by the latter.

The **straight** bill of lading is most commonly used. It is not assignable by endorsement.

The **order** bill of lading is used when goods are to be paid for before delivery or when the bill of lading is to be transferred to another party as assignee.

A **way bill** is a document issued in duplicate for the purpose of giving the routeing of the shipment. The first copy is kept by the railroad agent at the place from which the goods are shipped, and the second copy is sent to the agent at the destination of the goods.

The **freight rate** is the charge, usually per hundred pounds, according to the freight classifications. Freight classifications are based on the kind of article to be shipped, its weight, and the distance it is to be transported. The two kinds of rates are: **commodity rates** and **class rates.**

Commodity rates are rates charged on articles shipped in large quantities, such as grain, coal, lumber, and the like.

Class rates are rates charged on the many different articles, according to class, as shown in the freight classification.

A **freight bill** is a bill for the freight charges on a shipment.

Territory classification has to do with the division of the United States into freight classification districts as a means of adjusting freight rates.

Freight classification has to do with the classification of articles and commodities offered for shipment, as a means of determining the freight rate to be charged.

The **freight tariff** is a book showing the names of railroad stations, the classifications of articles or commodities, and the freight rates to be charged.

These terms are better understood as one comes to know their meaning in connection with freight shipments. Therefore, where it is thought desirable to give much attention to this subject in connection with the study of arithmetic, information should be obtained from the local freight office or offices.

Calculating Freight Charges

Example.—Find the freight on 4 cases of shoes from Lynn, Mass., to Denver, Colorado. The cases weigh 220, 224, 228, and 231 pounds, respectively. The freight rate as per first class, fast freight classification is $2.60 per 100 pounds.

220 lb.	903 lb. = 9.03 cwt.
224 lb.	9.03 × $2.60 = $23.48
228 lb.	
231 lb.	
903 lb.	

The total weight is 9.03 cwt. (hundred-weight). If the freight on 1 cwt. is $2.60, to find the freight on 9.03 cwt. multiply 9.03 by $2.60.

Problems

1. Find the freight charges on 5 carloads of wheat, weighing 42,000 lb., 43,200 lb., 39,600 lb., 41,300 lb., and 40,180 lb., respectively, shipped from Duluth, Minn., to Buffalo, N. Y. The freight rate was 18¢ per 100 lb.

2. The Elwell Plumbers' Supply Company of Boston, Mass., shipped to H. E. Howard, Bennington, Vt., 4 cases of plumbers' supplies, weighing 128 lb., 96 lb., 204 lb., and 138 lb. respectively. Find the freight charges at 67¢ per 100 pounds, second class.

3. Find the freight at \$1.48 per 100 pounds, second class, on 847 lb. of hardware shipped from Philadelphia, Pa., to Abingdon, Va.

4. Find the freight at 44¢ per 100 pounds, third class, on 6700 lb. of feed shipped from Philadelphia, to Scranton, Pa.

Shipments by Express

It is not within the possible scope of an arithmetic to give all the scales of rates on the many different classifications of articles likely to be offered for shipment by express. It is only after considerable experience in the express business that one will become trained in the use of express classifications, blocks, scales, and rates.

Express companies are willing to give full information to any one interested.

There are about 300 different scales of express rates, each one designated by a block number. Goods offered for shipment are classified as first, second, or third class. The scale of rates the goods come under depends on distance, valuation, weight and size of article to be shipped; and on whether the article is fragile, or perishable.

The problems resulting from shipments by express are comparatively simple after the rate has been decided upon. The rate is usually a fixed charge per pound or per 100 pounds, depending on scale and classification.

Calculating Express Charges

Example.—Find the express charges at \$2.70 per 100 pounds on 125 pounds, first class, from NewYork to Chicago.

$$1.25 \times \$2.70 = \$4.625, \text{ or } \$4.63$$

The agent for the express company, after referring to the *Rate Table and Block Tariff Sheet,*[3] and deciding on the classification, found the rate to be \$2.70 per 100 pounds.

Rates are classified as first-class, second-class, and third-class. Second-class rates are about one fourth less than first-class rates. Third-class rates are 1¢ for each 2 ounces, with a minimum charge of 15¢, and a maximum charge of not more than the first-class rate.

[3] Issued by the American Railway Express Company.

Problems

1. Find the express charges on a shipment of 175 lb., first-class, from Boston to New York. The rate is $1.45 per 100 pounds.

2. Find the express charges on dry goods, shipped first-class, from Boston, Mass., to Albany, N. Y. as follows: 3 packages weighing 34 lb., 28 lb., and 62 lb., respectively. The rate is $1.45 per 100 pounds.

3. Find the express, at $2.05 per 100 pounds on a bicycle, weighing 112 lb. crated, shipped first-class from Boston, Mass., to Bangor, Maine.[4]

4. The Martin Company of Philadelphia, Pa., shipped by express, first-class, 2 packages of dress goods, weighing 87 lb. and 128 lb. respectively, to J. H. Cameron, Warren, Ohio. If the rate is $2.60 per 100 pounds, how much was the express?

5. The Keystone Ice Cream Company of Philadelphia, Pa., shipped 10 gal. of ice cream daily to the D. E. Halton Company, Reading, Pa. The ice cream, when packed for shipment, weighed 188 lb. If the rate is $1.15 per 100 pounds, how much was the total express for a period of 30 days?

PAY ROLLS

A pay roll is a record—extending over a period, usually of one week—of the time each employee has worked, the rate of pay, and the amount of wages to be paid. In case the employee works at piece work, the record shows, over a period of time, the number of pieces completed, the rate of pay, and the amount to be paid.

Workmen are paid by the hour, day, week, or month. When paid by the hour, the records may show fractions of an hour: halves, quarters, or tenths, and sometimes exact minutes, depending on what the employer requires. Piece rate workmen are also paid by the piece, by the dozen, by the hundred, by the thousand, and so forth.

There is usually some device for recording workmen's time, or keeping a record of work completed, as in the case of piece work. Usually this record is kept on a time card, or, in the case of piece work, on a record sheet or card. Very often some mechanical device, such as a recording stamp,

[4] When the article shipped weighs less than 100 lb. the rate is more, proportionately. On packages weighing from 1 to 10 lb. the rate is approximately $\frac{1}{3}$ to $\frac{1}{4}$ of the 100 lb. rate. The more the article weighs up to 100 lb., the less, proportionately, is the rate.

or a time clock, is used for recording workmen's time. (See fig. 3.)

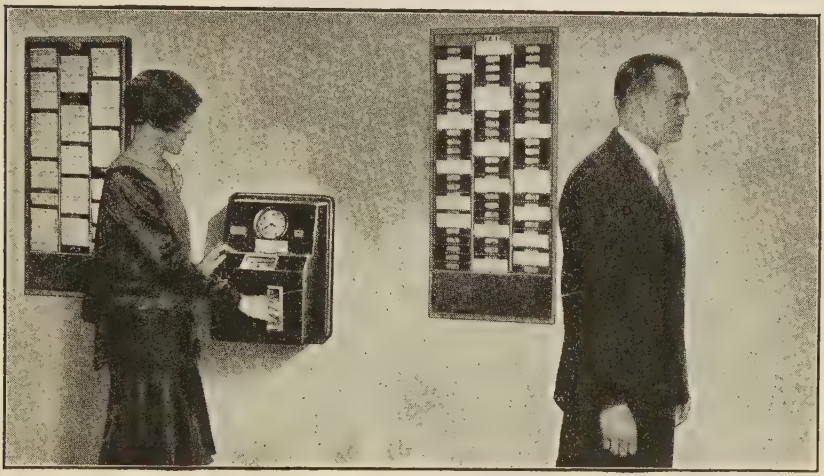


Fig. 3.—Time Clock in Use.

The following pay roll forms illustrate some of the different varieties in common use:

PAY ROLL

No.	*Name*	*M*	*Tu*	*W*	*Th*	*F*	*S*	*Total Hours*	*Per Hour*	*Total*	*Remarks*
1	Adams, Charles....	8	7	8	8	6	4		.90		Lost 3 hr.
2	Baker, James.....	8	8	4	8	8	4		1.10		½ day W.
3	Cossey, Henry.....	8	8	8	8	8	4		.87½		
4	Daniels, John.....	8	8	8	0	8	4		.85		Not in Th.
5	Evans, Arthur.....	8	8	8	8	8	0		.90		
6	Fowler, Lane.....	8	4	8	8	8	4		1.10		½ day Tu.
7	Grant, George.....	0	8	8	8	8	4		.80		Not in M.
8	Harper, William....	8	8	8	8	8	4		.87½		
	TOTAL.....										

Problems

1. Copy the above pay roll, find the total number of hours each workman worked, the amount of wages due each one, and the total to be paid.

PAY ROLL FOR THE WEEK ENDING OCTOBER 6, 19—

No.		*M*	*T*	*W*	*T*	*F*	*S*	*Hours*	*Days*	*Wage*	*Amount*
1	Barton, Harry	8	8	4	8	8	4			$ 6.00	
2	Coon, Edward	8	8	8	6	8	4			7.80	
3	Davis, John	8	8	8	8	8	4			6.00	
4	Gantz, Samuel	4	8	8	8	8	4			7.80	
5	Howard, Richard	8	4	8	8	4	0			10.50	
6	King, Louis	8	8	8	8	8	4			10.50	
7	Moore, George	8	8	8	4	4	4			12.00	
8	Parker, Francis	8	8	8	8	8	4			12.00	
9	Rich, James	8	7	7	4	4	4			6.00	
10	Thomas, Jack	8	8	8	8	8	4			12.00	

2. In the pay roll above, find the number of hours, the number of days at 8 hours per day, and the amount due each workman at the daily wage opposite his name.

Example.—

$$8 + 8 + 4 + 8 + 8 + 4 = 40$$

$40 \div 8 = 5$ days.

5 days at $6 per day = $30, due Harry Barton.

TIME SHEET NO. 8

No.		*Hours per day*						*Per Hour*	*Amt.*	*Over-time*	*Amt.*	*Total Wages*
		M	*T*	*W*	*T*	*F*	*S*					

3. Draw up a form in the same style as Time Sheet No. 8 for 6 names and fill in the following, allowing 8 hours for a day, one-half day on Saturday, and time and a half for overtime:

Anderson, Carter: M., 8 hr.; T., 10 hr.; W., 9 hr.; T., 8 hr.; F., 10 hr.; S., 6 hr.; at 90¢ per hour.

Camp, Ernest: M., 10 hr.; T., 8 hr.; W., 8 hr.; T., 9 hr.; F., 8 hr.; S. 4 hr.; at 80¢ per hour.

Dorne, Henry: M., 8 hr.; T., 6 hr.; W., 10 hr.; T., 10 hr.; F., 8 hr.; S., 8 hr.; at $1.10 per hour.

Emerson, William: M., 8 hr., T., 9 hr.; W., 10 hr.; T., 8 hr.; F., 9 hr.; S., 4 hr.; at 90¢ per hour.

Ferguson, Mark: M., 8 hr.; T., 8 hr.; W., 8 hr.; T., 8 hr.; F., 8 hr.; S., 4 hr.; at 80¢ per hour.

Johnson, Homer: M., 10 hr.; T., 9 hr.; W., 8 hr.; T., 9 hr.; F., 10 hr.; S., 4 hr.; at $1.00 per hour.

Figure regular time first and then figure the overtime for each man:

Example.—

Anderson, Carter: 8 + 8(O.T.2) + 8(O.T.1) + 8 + 8(O.T.2) + 4(O.T.2) = 44 hr. regular and 7 hr. overtime

44 hr. at 90¢ per hr.	= $39.60
7 hr. at (90¢ + 45¢) $1.35 =	9.45
Total amount due Anderson,	$49.05

Prepare a change memorandum for Time Sheet No. 8. in the following manner:

No.	*Amt.*	$20	$10	$5	$2	$1	50¢	25¢	10¢	5¢	1¢
1	49 05	2		1	2					1	

5. Prepare a pay roll slip to be handed in at the bank, together with the check for the amount of Time Sheet No. 8. Follow the model shown on p. 58. (These slips are usually handed in at the bank a day in advance, so that the bank will have the money ready on time.)

PAY ROLL SLIP
UNION BANK AND TRUST CO.
NEW YORK, N. Y.
Currency wanted by

Denominations	*No.*	*Amt.*	
Twenties			
Tens			
Fives			
Twos			
Ones			
Halves			
Quarters			
Dimes			
Nickels			
Cents			
TOTAL			

PIECE WORK PAY ROLL NO. 12
JUDSON MOORE & CO. DECEMBER 8, 19—

No.	*Name*	*Pieces Completed*						*Total*	*Rate*	*Amount*		*Paid*
		M	*T*	*W*	*T*	*F*	*S*					
1	Adams, Helen	38	37	42	40	36	20		11¢			
2	Bancroft, Jane	37	35	39	41	38	18		11¢			
3	Carroll, Agnes	41	40	39	37	38	19		11¢			
4	Drake, Mary	72	76	71	69	78	42		6¢			
5	Harper, Ruth	69	68	70	72	67	41		6¢			
6	Jackson, Anna	92	90	89	87	92	44		4½¢			
7	King, Harriet	88	88	86	89	90	45		4½¢			
8	Marsh, Edna	112	110	111	113	108	56		3½¢			
		TOTAL										

6. Complete Pay Roll No. 12, and make out in correct form a change memorandum and a pay roll slip.

PAY ROLL AND CHANGE MEMORANDUM NO. 15

No.	Name	Hours per Day						Total Hours	Wages per Hour	Total Wages	Bills and Specie Required								
		M	T	W	T	F	S				$10	$5	$2	$1	50¢	25¢	10¢	5¢	1¢
								TOTALS											

7. Prepare a form in the same style as Pay Roll and Change Memorandum No. 15, and record thereon the following:

No. 1. Atwell, Robert: M., 8 hr.; T., 7½ hr.; W., 7 hr.; T., 8 hr.; F., 6½ hr.; S., 4 hr.; at 95¢ per hour.

No. 2. Bogart, Ralph: M., 6 hr.; T., 8 hr.; W., 8 hr.; T., 7½ hr.; F., 8 hr.; S., 3½ hr.; at 90¢ per hour.

No. 3. Cooper, Carl: M., 8 hr.; T., 8 hr.; W., 7 hr.; T., 6¾ hr.; F., 8 hr.; S., 2 hr.; at 80¢ per hour.

No. 4. Durr, John: M., 8 hr.; T., 4 hr.; W., 6½ hr.; T., 8 hr.; F., 7½ hr.; S., 4 hr.; at 88¢ per hour.

No. 5. Edwards, Wm.: M., 8 hr.; T., 8 hr.; W., 3½ hr.; T., 8 hr.; F., 7 hr.; S., 3 hr.; at 90¢ per hour.

No. 6. Frank, Howard: M., 8 hr.; T., 7 hr.; W., 6½ hr.; T., 5½ hr.; F., 8 hr.; S., 4 hr.; at 70¢ per hour.

No. 7. Grant, Fred: M., 8 hr.; T., 7 hr.; W., 8 hr.; T., 6 hr.; F., 7 hr.; S., 4 hr.; at 85¢ per hour.

No. 8. Osborn, Evertt: M., 8 hr.; T., 4 hr.; W., 8 hr.; T., 8 hr.; F., 4 hr.; S., 4 hr.; at 95¢ per hour.

8. Fill out the change memorandum and prepare a pay roll slip for the bank.

Time Recording

Where the time recording clock is used, a record card, similar to the form shown on p. 60, is kept. This card is put in the machine each time the employee comes in or goes out, and the time is automatically stamped on the card, as illustrated. Many different forms are in common use. On the following page is one form:

TIME RECORDING CLOCK RECORD CARD[1]

WEEK ENDING December 15, 19__

No. 24

NAME James Harris

	Morning In	*Noon Out*	*Noon In*	*Night Out*	*Extra In*	*Extra Out*	
	M 701	M 1202	M 1250	M 503			$9\frac{1}{4}$
	TU 659	TU 1205	TU 1255	TU 459			$9\frac{1}{4}$
	W 645	W 1130	W 1254	W 501	W 600	W 905	12
	TH 655	TH 1201	TH 1250	TH 505			$9\frac{1}{4}$
	FR 653	FR 1200	FR 1259	FR 504			$9\frac{1}{4}$
	SA 658	SA 1202	SA 102	SA 500			9

TOTAL TIME 58 HRS.

RATE 80

TOTAL WAGES FOR WEEK $46.40

[1] The time is reckoned to the nearest $\frac{1}{4}$ hour.

This type of weekly card is used where all employees arrive and depart on the the same regular schedule.

READING GAS AND ELECTRIC METERS

Gas Meters

Gas furnished to the consumer is run through a gas meter, which measures the number of cubic feet of gas consumed. The price charged for gas consumed is a certain rate per 1000 cubic feet.

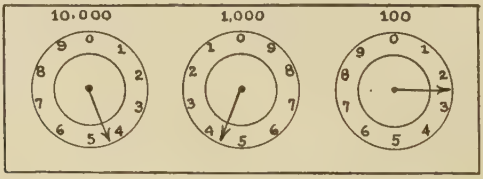


Fig. 4a.

The dials on this gas meter registered 4420 cu. ft. when read on June 15, as shown in fig. 4a.

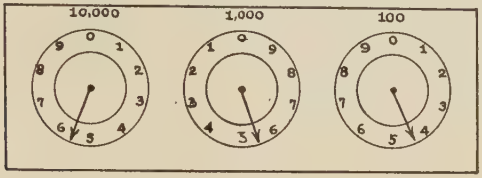


Fig. 4b.

The dials on the same gas meter registered 5540 cu. ft., as shown in fig. 4b, when read on July 15. These readings indicate that 1120 cu. ft. (5540 − 4420) were consumed.

In reading a gas meter, the right-hand dial is read from left to right, the center dial is read from right to left, and the left-hand dial is read from left to right. (See fig. 4a–b.)

The left-hand dial shows the number of tens of thousands of cubic feet, the center dial the number of thousands, and the right-hand dial the number of hundreds.

Problem

1. Find the cost of gas consumed as recorded on the following card:

Meter No.	*Date*	*Present Reading*	*Date*	*Last Reading*	*Cu. Ft. Consumed*	*Rate 1000 Cu. Ft.*	*Amount*	*Checked By*
1042	Oct. 22	12800	Sept. 21	11400		1.25		
1051	Oct. 22	14700	Sept. 22	12600		1.15		
1044	Oct. 23	8600	Sept. 22	7300		1.25		
1540	Oct. 24	5900	Sept. 23	4100		1.10		
1555	Oct. 24	11800	Sept. 24	8900		1.35		
1750	Oct. 25	3900	Sept. 24	2700		1.20		
1280	Oct. 25	17800	Sept. 24	12500		1.45		
1580	Oct. 26	28900	Sept. 25	18700		1.15		

Electric Meters

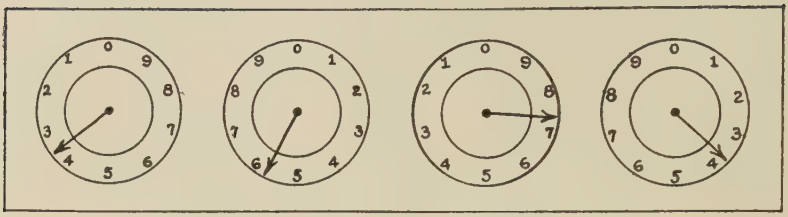


Fig. 5—Last Reading July 15.

Dials on this electric meter registered 3328 on June 15, and registered 3573 on July 15. Subtracting (3573 − 3328) indicates that 245 kw.-hr. (kilowatt hours) were consumed.

The unit of measurement expressed in reading an electric meter is *kilowatt hours*, kw.-hr.

The dial on the right shows the single hours; the next one to the left shows the tens; the next, hundreds, and the next, thousands.

In reading an electric meter, the single hour and hundred hour dials are read from left to right, and the ten hour and thousand hour dials are read from right to left. (See fig. 5.)

Problem

1. Find the cost of electric current consumed.

Meter No.	*Date*	*Reading*	*Date*	*Reading*	*Kw.-hr. Used*	*Rate*	*Amount*	*Checked By*
480	Dec. 17	670	Nov. 16	440		12¢		
478	Dec. 17	840	Nov. 17	580		12¢		
492	Dec. 18	920	Nov. 17	860		11¢		
581	Dec. 18	925	Nov. 18	840		11¢		
784	Dec. 19	1174	Nov. 18	880		10¢		
495	Dec. 19	1448	Nov. 19	1424		11¢		
621	Dec. 20	1270	Nov. 20	965		12¢		

SIMPLE INTEREST

Interest is the amount charged for the use of borrowed money, or the income for the use of money loaned or invested.

Hence, the bookkeeping terms, **interest cost** and **interest earned.**

Here is a typical example: Harris borrowed \$500 from Ellis for one year at 6% interest. The interest amounted to \$30. It cost Harris \$30 for the use of \$500 for one year. In other words, Ellis received an income of \$30 from the \$500 he loaned to Harris. Therefore, the interest cost to one party, the borrower, is the interest income to another party, the lender.

The **principal** is the amount of money borrowed, loaned, or invested. In the illustration given above, \$500 is the principal.

Rate is the number of per cent charged for the use of money.

Time is the period for which the money is borrowed or loaned.

As a means of simplifying the calculations in interest, a year is considered as having 360 days, or 30 days each month, for the 12 months.

To find the amount of interest, when the principal, rate, and time are given.—

When the rate of interest is 6%, the interest on \$1 for one year is \$.06. Therefore, the interest on \$1 for two months, or 60 days, is $\frac{1}{6}$ of \$.06, or 1¢, which is equal to 1%. (60 days is $\frac{1}{6}$ of 360 days, or $\frac{1}{6}$ of a year.) Hence, *to find the interest on any principal for* 60 *days at* 6%, *find* 1% *of the principal, or point off two places.*

For example, the interest on \$1280 for 60 days at 6% is \$12.80.

The 60-Day Method

To find the interest on any principal at 6%:

1. *To find the interest for* 6 *days at* 6% *point off* 3 *places.*
2. *To find the interest for* 60 *days at* 6% *point off* 2 *places.*
3. *To find the interest for* 600 *days at* 6% *point off* 1 *place.*
4. *For* 6000 *days at* 6% *the interest equals the principal.*

Examples.—

1. Find the interest on \$480 for 66 days at 6%.

\$480 for 66 days
\$4.80, the int. for 60 days
.48, the int. for 6 days
\$5.28, the int. for 66 days

Pointing off 2 places gives the interest for 60 days, and pointing off 3 places gives the interest for 6 days. Add.

2. Find the interest on \$560 for 90 days at 6%.

\$560 for 90 days
\$5.60, the int. for 60 days
\$2.80, the int. for 30 days
\$8.40, the int. for 90 days

Pointing off 2 places gives the interest for 60 days, or \$5.60. The interest for 30 days is $\frac{1}{2}$ of the interest for 60 days, or \$2.80. The interest for 90 days (60 days + 30 days) is the sum, or \$8.40.

Use of aliquot parts.—

In finding the interest by the 60-day method, 60 is the basis, and the aliquot parts of 60 are used when the time is greater or less than 60 days.

Problems

What part of 60 is each of the following?

1. 6 days	**4.** 30 days	**7.** 10 days
2. 15 days	**5.** 4 days	**8.** 3 days
3. 20 days	**6.** 5 days	**9.** 12 days

Example.—What are the aliquot parts of 60 days contained in (a) 48 days? (b) 56 days? (c) 78 days?

(a)	(b)	(c)
30 days	30 days	60 days
15 days	20 days	15 days
3 days	6 days	3 days
48 days	56 days	78 days

Problems

What are the aliquot parts of 60 in each of the following?

1. 75 days	**6.** 129 days	**11.** 99 days
2. 40 days	**7.** 145 days	**12.** 34 days
3. 96 days	**8.** 21 days	**13.** 76 days
4. 39 days	**9.** 105 days	**14.** 150 days
5. 27 days	**10.** 87 days	**15.** 126 days.

Examples.—

1. Find the interest on \$842.60 for 124 days at 6%.

\$824.60 for 124 days
\$8.426, the int. for 60 days
\$8.426, the int. for 60 days
.5617, the int. for 4 days
(4 days = $\frac{2}{3}$ of 6 days)
\$17.4137, the int. for 124 days
or
\$17.41

Sixty days plus 60 days plus 4 days equals 124 days. Twice the interest for 60 days plus the interest for 4 days equals \$17.41. (The answer should be given in the nearest whole cent.)

2. Find the interest on \$487.80 for 47 days at 6%.

\$487.80 for 47 days
\$2.439, the int. for 30 days
\$1.2195, the int. for 15 days
.1626, the int. for 2 days
\$4.8211, the int. for 47 days
or
\$4.82

Thirty days are $\frac{1}{2}$ of 60 days. 30 days + 15 days + 2 = 47 days. The sum of the interest for 30 days, 15 days, and 2 days is \$4.82.

Simplified Methods.—

1. *To simplify the process, the amount of the principal and the number of days may be interchanged.*

Example.—Find the interest on \$120 for 187 days at 6%.

\$187 for 120 days
\$1.87, the int. for 60 days
1.87, the int. for 60 days
\$3.94, the int. for 120 days

Interchange the \$120 and the 187 days. Using the 120 as days instead of principal gives two 60-day periods, and, using 187 days as the principal, the interest is easily found to be \$1.87 for 60 days, or \$3.94 for 120 days.

Problems

Find the interest at 6 % on the following:

1. \$340 for 3 days	**6.** \$488 for 29 days	**11.** \$ 460 for 39 days
2. \$586 for 36 days	**7.** \$384 for 33 days	**12.** \$ 578 for 42 days
3. \$824 for 45 days	**8.** \$590 for 56 days	**13.** \$ 770 for 53 days
4. \$720 for 48 days	**9.** \$870 for 66 days	**14.** \$1260 for 75 days
5. \$960 for 24 days	**10.** \$1140 for 23 days	**15.** \$1440 for 35 days

2. *Sometimes the process can be simplified by deducting from the interest for* 60 *days, the interest for the difference in time between the time given and* 60 *days.*

Example.—Find the interest on \$140 for 50 days at 6%.

\$140 for 50 days
\$1.40, the int. for 60 days
\$ .70, the int. for 30 days
\$ .4666, the int. for 20 days
\$1.1666, the int. for 50 days
or
\$1.17

60 days − 50 days = 10 days
\$1.40, the int. for 60 days
Deduct .2333, the int. for 10 days
\$1.1666, the int. for 50 days
or
\$1.17

Extend a nonterminating result four places beyond the decimal point.

To find the interest at a rate other than 6%.—

To find the interest at a rate more or less than 6%, *first find the interest at* 6%. *Then proceed as follows*:

At 3%, deduct $\frac{1}{2}$ of the interest at 6%
At 4%, deduct $\frac{1}{3}$ of the interest at 6%.
At 4$\frac{1}{2}$%, deduct $\frac{1}{4}$ of the interest at 6%.
At 5%, deduct $\frac{1}{6}$ of the interest at 6%.
At 7%, add $\frac{1}{6}$ of the interest at 6%.
At 7$\frac{1}{2}$%, add $\frac{1}{4}$ of the interest at 6%.
At 8%, add $\frac{1}{3}$ of the interest at 6%.
At 9%, add $\frac{1}{2}$ of the interest at 6%.

Example.—Find the interest on \$680 for 145 days at 5% and at 7$\frac{1}{2}$%.

\$680 for 145 days
\$ 6.80, the int. for 60 days
\$ 6.80, the int. for 60 days
\$ 2.266, the int. for 20 days
\$ .566, the int. for 5 days
6 | \$16.432, the int. for 145 days at 6%.
2.738
\$13.694, the int. for 145 days at 5%.
or \$13.69

At 7$\frac{1}{2}$%
4 | \$16.432
4.108
\$20.540

The interest on \$680 for 145 days at 7$\frac{1}{2}$% is \$20.54. The interest at 5% is $\frac{1}{6}$ less than the interest at 6%, or \$13.69. The interest at 7$\frac{1}{2}$% is $\frac{1}{4}$ more than the interest at 6%, or \$20.54.

Problems

Find the interest on the following:

1. \$ 360 for 85 days at 5%
2. \$ 740 for 96 days at 7%
3. \$1120 for 120 days at 4%
4. \$ 690 for 99 days at 7$\frac{1}{2}$%
5. \$1280 for 39 days at 4$\frac{1}{2}$%
6. \$2460 for 75 days at 3%
7. \$3780 for 93 days at 5%
8. \$ 190 for 156 days at 8%
9. \$ 312 for 129 days at 9%
10. \$1640 for 146 days at 4$\frac{1}{2}$%

The One-day, or Product, Method

To find the interest on any principal at 6% by the 1-day, or product, method, point off three places, that is, remove the

decimal point three places to the left; multiply by the number of days, and divide the product by 6.

Example.—Find the interest on \$848.75 for 21 days at 6%.

$$\begin{array}{r} \$.84875 \\ 21 \\ \hline 84875 \\ 16\ 9750 \\ \hline \$17.82375 \end{array}$$

First, point off three places in the principal, multiply by 21. \$17.82375 ÷ 6 = \$2.9706, or \$2.97. The interest on \$848.75 for 21 days at 6% is \$2.97.

Removing the decimal point three places to the left gives the interest on the principal for 6 days at 6%, or for 1 day at 36%. Multiplying by the number of days gives the interest at 36%, and dividing by 6($\frac{1}{6}$ of 36) gives the interest at 6%.

Example.—Find the interest on \$795 for 53 days at 6%.

Pointing off three places gives the interest for 1 day at 36%. Multiplying by 53 gives the interest at 36% for 53 days. Dividing by 6 gives the interest at 6% for 53 days.

$$\$.795 \times 53 \div 6 = \$7.02$$

The one-day, or product, method can be used to advantage when the time can not be divided easily into aliquot parts of 60.

Problems

Find the interest by the product method at 6% on the following:

1. \$1250 for 17 days
2. \$1560 for 22 days
3. \$830 for 27 days
4. \$1160 for 41 days
5. \$535 for 78 days
6. \$1570 for 55 days

All problems in simple interest can, however, be worked by the 60-day method. This method is preferred to all others because it lends itself more readily to mental calculations, thereby saving considerable time.

BANK DISCOUNT

Bank discount is interest charged by a bank for advancing money on commercial paper (notes and time drafts).

The owner of the paper must endorse it over to the bank. It is then held by the bank until it is due, as security for the money advanced.

When the paper becomes due, the bank collects from the maker, or the one whose name is signed to the paper. If the maker fails to pay, the one for whom the bank discounted the paper or the endorser will have to pay it.

Simple bank discount is figured in the same way as simple interest.

In bank discount, interest is figured for the time (actual number of days) between the discount date and the due date.

To find the amount of bank discount when the rate is given.—

Example.—Find the bank discount at 6%, and the proceeds of a 92-day note for $1500. The date of the note is July 1, 1928, and the due date is October 1, 1928. Therefore, 92 days is the term of discount.

July 1, 1928, discount date — October 1, 1928, due date

92 days

6%

July	30	$1500
Aug.	31	$15.00, the dis. for 60 days
Sept.	30	$ 7.50, the dis. for 30 days
Oct.	1	$ .50, the dis. for 2 days
	92 days	$23.00, the dis. for 92 days

$1500 − $23 dis. = $1477 net proceeds

Find the discount by the 60-day method for figuring interest. The result is $23. The face of the note, $1500 − $23, the discount = $1477, the proceeds.

To find the term of discount, count the days between the discount date and the due date.[1]

[1] In counting the days, the discount date is *not* counted, but the due date *is* counted.

Problems

Find the bank discount at 6%, and the proceeds of the following:

No.	*Face*	*Time*	*Date of Paper*	*Date of Discount*	*Due Date*	*Term of Discount*	*Discount*	*Proceeds*
1	$1200	90 days	Sept. 1	Sept. 1				
2	2500	122 days	June 10	June 10				
3	3000	60 days	Oct. 5	Oct. 20				
4*	1000	3 months	July 7	July 7				
5	900	4 months	Aug. 6	Aug. 6				
6	2100	30 days	May 10	May 20				
7	5000	10 days	Apr. 1	Apr. 1				
8	750	2 months	Mar. 6	Mar. 6				

* If time is given in months, for example, three months, find the due date as follows: July 7 Aug. 7, Sept. 7, Oct. 7. Hence Oct. 7 is the due date.

Interest and bank discount are treated more fully later in this work.

CASH DISCOUNT

Cash discount is a discount allowed on a bill, or invoice of goods, for payment to be made at a stated time before the full term of credit has expired. Hence, the terms 2/10—n/30 mean that 2% discount will be allowed if the bill is paid within 10 days, but that no discount will be allowed if the full term of credit (30 days) is taken. The character *n* stands for *net*, or clear of all deductions.

The rate of discount expresses the number of hundredths of the bill to be deducted. Thus, 5% equals $\frac{5}{100}$ or .05.

To find the cash discount, when the amount of the bill and rate of discount are given.—

To find the cash discount on a bill, find the number of hundredths the rate of discount is of the amount of the bill.

Example.—The terms on a bill of goods amounting to $1365 are 3/10—n/60 (3% discount within 10 days, or the full amount of the bill in 60 days). Find the cash discount and the net amount.

$1365 \times 3\%$ ($\frac{3}{100}$ or .03) = $ 40.95, the discount
$1365 - 40.95 = $1324.05, the net amount

The rate, expressed as hundredths, times the amount of the bill equals the discount. The amount of the bill minus the discount equals the net amount, or net cost.

Problems

Find the cash discount and the net amount of the following:

No.	*Amount of Bill*	*Terms*	*Discount*	*Net Amount*
1	$1275	4/10, n/90		
2	$1780.60	3/5, n/30		
3	$1560.80	2/10, n/30		
4	$ 886.70	5/10, n/4 mo.		
5	$1160.70	6/10, n/4 mo.		
6	$1677.20	4/10, n/60		
7	$ 375.25	4/10, n/4 mo.		
8	$2435.15	3/10, n/90		

TRADE DISCOUNTS

Trade discounts are discounts allowed to dealers. These discounts vary in different lines of business. In some lines, in the case of catalogue prices, these discounts run as high as 50% or 60%, and sometimes higher.

In problems where there are two discounts, compute the first discount and then compute the second discount on the remainder.

To find the net cost when the amount of the bill and the trade discounts are given.—

Example.—Find the net cost of a lamp listed at $35, less 20% and 10%.

$35 \times .20 (20\%) = $ 7.00, discount
$35 - $7 = $28, the cost after first discount is taken
$28 \times .10 (10\%) = $ 2.80, discount
$28 - $2.80 = $25.20, the net cost

Problems

Find the trade discounts and the net cost of each of the following, using aliquot parts whenever possible:

No.	*List*	*Discounts*	*Discount*	*Net Cost*
1	$ 375	33⅓%		
2	$ 480	25% and 10%		
3	$1525.60	25% and 20%		
4	$ 765.50	50% and 10%		
5	$2460	35%		
6	$3120	10% and 5%		
7	$ 600	16⅔% and 5%		
8	$4250	8% and 2%		

Trade discounts are treated more fully later in this work.

WEIGHTS AND MEASUREMENTS

Weights and measurements are determined by the use of standard units which are fixed by law.

These standard units have specific names. When they are used with a stated quantity, they are commonly referred to as **denominate numbers,** for example, 2 feet, 3 yards, 7 pounds.

TABLES OF MEASURE

Linear Measure

12 inches (in.) = 1 foot (ft.)
3 feet = 1 yard (yd.)
16½ feet = 1 rod (rd.)
5½ yards = 1 rod (rd.)
320 rods = 1 mile (mi.) = 5280 ft.

1 hand = 4 inches; 1 fathom = 6 feet; 1 nautical, or geographical, mile = 1.152⅔ miles or 6080.27 feet; 3 miles = 1 league.

The units in this table represent length only, and are used to measure distances or to measure lengths, widths, or thicknesses of objects. The unit of length is the standard **yard.**

Surveyors now use a steel tape, divided into feet, tenths of a foot, and sometimes into inches, instead of the surveyors' linear measure.

Square Measure

144 square inches (sq. in.)	= 1 square foot (sq. ft.)
9 square feet	= 1 square yard (sq. yd.)
$30\frac{1}{4}$ square yards	= 1 square rod (sq. rd.)
160 square rods	= 1 acre (A.) = 43,560 sq. ft.
640 acres	= 1 square mile (sq mi.)

1 sq. mi. = 102,400 sq. rd. = 3,097,600 sq. yd. = 27,878,400 sq. ft.

A **square** is 10 ft. $\times$ 10 ft., or 100 square feet. It is commonly used in roofing.

Square measure is used to measure surfaces, and the number of units of square measure in a surface is its **area.**

A plot 6 feet square, for example, has in its surface 6 ft. $\times$ 6 ft., or 36 sq. ft.

Cubic Measure

1728 cubic inches (cu. in.)	= 1 cubic foot (cu. ft.)
27 cubic feet	= 1 cubic yard (cu. yd.)
$24\frac{3}{4}$ cubic feet	= 1 perch (P.)
128 cubic feet	= 1 cord (cd.)

Cubic measure is used to measure solids, as well as the contents or capacity of bins, tanks, and the like. The number of units of cubic measure which a solid contains makes up its **solid contents,** or its **volume.**

A **perch** (used to measure stone or masonry) is $16\frac{1}{2}$ feet long, $1\frac{1}{2}$ feet wide, and 1 foot high ($24\frac{3}{4}$ cu. ft.).

A **cord** of wood is 8 feet long, 4 feet wide, and 4 feet high (128 cu. ft.).

Circular Measure

60 seconds (″)	= 1 minute (′)
60 minutes	= 1 degree (°)
360 degrees	= 1 circle (cir.)

A **right angle** is an angle of 90 degrees (90°).

A **quadrant** is $\frac{1}{4}$ of a circle, (90°)

A **sextant** is $\frac{1}{6}$ of a circle, (60°).

A **sign** is $\frac{1}{12}$ of a circle, (30°).

Liquid Measure

4 gills (gi.)	= 1 pint (pt.)
2 pints	= 1 quart (qt.)
4 quarts	= 1 gallon (gal.)
31½ gallons	= 1 barrel (bbl.)

The U. S. gallon contains 231 cubic inches.

The imperial gallon of England contains 277.274 cubic inches and weighs 10 pounds.

A gallon of water (U. S. gallon) weighs about 8⅓ pounds.

A cubic foot of water weighs 62½ pounds.

Apothecaries' Fluid Measure

60 minims (m.)	= 1 fluid drachm, or dram (f℥)
8 fluid drachms	= 1 fluid ounce (f℥)
16 fluid ounces	= 1 pint (O)
8 pints	= 1 gallon (Cong.)

Apothecaries' fluid measure is used by druggists in preparing medicines.

Dry Measure

2 pints (pt.)	= 1 quart (qt.)
8 quarts	= 1 peck (pk.)
4 pecks	= 1 bushel (bu.)

Dry measure is used in measuring bulky articles such as grain, and vegetables.

The unit of dry measure is the bushel, which contains 2150.42 cubic inches. The heaped bushel contains 2747.41 cubic inches.

WEIGHT

The four kinds of weight in use in the United States are: **Troy, apothecaries', avoirdupois,** and **metric.** (Metric is the decimal system of weights.)

Troy Weight

24 grains (gr.)	= 1 pennyweight (pwt.)
20 pennyweights	= 1 ounce (oz.)
12 ounces	= 1 pound (lb.)

Troy weight is used in weighing precious metals, such as gold and silver.

Apothecaries' Weight

20 grains (gr.)	= 1 scruple (sc.)
3 scruples	= 1 dram (dr.)
8 drams	= 1 ounce (oz.)
12 ounces	= 1 pound (lb.)

Apothecaries' weight is used in weighing drugs and chemicals.

Avoirdupois Weight

16 ounces (oz.)	= 1 pound (lb.)
100 pounds	= 1 hundredweight (cwt.)
20 hundredweight	= 1 ton (T.)

Avoirdupois weight is used to weigh the coarser and heavier commodities, such as hay, grain, coal, and the like.

Some Comparisons

The liquid gallon contains 231 cu. in. and the dry gallon contains $268\frac{4}{5}$ cu. in.

The short ton contains 2000 lb. and the long ton contains 2240 lb.

The Troy and the Apothecaries' pound each contains 5760 grains, and the ounce contains 480 grains.

The avoirdupois pound contains 7000 grains and the ounce contains $437\frac{1}{2}$ grains.

The carat is equal to 3.168 grains, and it means a $\frac{1}{24}$ part. Gold marked 18 carat is $\frac{18}{24}$ pure gold and $\frac{6}{24}$ of some other metal.

BUSHEL WEIGHTS

In most of the states the following weights are used in a bushel:

Barley,	48 lb.	Onions,	57 lb.
Beans,	60 lb.	Peas,	60 lb.
Buckwheat,	48 lb.	Potatoes	60 lb.
Clover seed,	60 lb.	Sweet potatoes,	54 lb.
Corn (shelled),	56 lb.	Rye,	56 lb.
Oats,	32 lb.	Wheat,	60 lb.

BARREL AND KEG WEIGHTS

The following are some weights of commodities:

Butter, firkin, 56 lb.	Nails, keg, 100 lb.
Flour, barrel, 196 lb.	Beef and pork, barrel, 200 lb.
Salt, barrel, 280 lb.	

MEASURES OF TIME

60 seconds (sec.)	= 1 minute (min.)
60 minutes	= 1 hour (hr.)
24 hours	= 1 day (da.)
7 days	= 1 week (wk.)
30 days	= 1 month (mo.)
12 months	= 1 year (yr.)
52 weeks	= 1 year
365 days	= 1 year
366 days	= 1 leap year
100 years	= 1 century

OTHER MEASURES

Counting

20 units	= 1 score
12 units	= 1 dozen
12 dozen	= 1 gross (gro.)
12 gross	= 1 great gross (gr. gro.)

Paper Measure

24 sheets	= 1 quire (qr.)
20 quires	= 1 ream (rm.)[1]
2 reams	= 1 bundle (bdl.)
5 bundles	= 1 bale (bl.)

MEASURES OF VALUE

U. S. Money

10 mills	= 1 cent (¢)
10 cents	= 1 dime
10 dimes	= 1 dollar
10 dollars	= 1 eagle

English Money

4 farthings (far.)	= 1 penny (d.)
12 pence	= 1 shilling (s.)
20 shillings	= 1 pound sterling (£)
£1	= $4.8665

[1] Although there are usually 480 sheets in a ream, publishers and printers, since they estimate on a basis of 1000 sheets, allow 500 sheets to a ream.

French Money

10 millimes = 1 centime
10 centimes = 1 decime
10 decimes = 1 franc ($.0391\frac{3}{4}$)

German Money

100 pfennig (pf.) = 1 mark
1 mark = $.238

THE METRIC SYSTEM

The **metric system** is a decimal system of weights and measures in which the fundamental unit is the **meter,** the unit of length. From this, the units of capacity (**liter**) and of weight (**gram**) were derived. All other units are decimal subdivisions or multiples of these.

The length of the meter (39.37 in.) was taken to be one ten-millionth of the distance from the equator to the pole. Later and more accurate measurements have proved this to be only approximately correct.

The metric tables are formed by combining the words *meter, gram,* and *liter* with six numerical prefixes. The meter is the unit for length, and the gram is the unit for weight or mass. The liter is the unit for capacity.

The Latin prefixes are:

milli- = one-thousandth .001
centi- = one-hundredth .01
deci- = one-tenth .1

The Greek prefixes are:

deca- = ten 10.
hecto- = one hundred 100.
kilo- = one thousand 1000.

The metric system has been legalized in the United States and is used extensively in scientific work.

METRIC TABLES

Linear Measure

10 millimeters (mm.) = 1 centimeter (cm.)
10 centimeters = 1 decimeter (dm.)
10 decimeters = 1 meter (m.) 39.37 in.
10 meters = 1 decameter (Dm.)
10 decameters = 1 hectometer (Hm.)
10 hectometers = 1 kilometer (Km.) .62 mi.

Square Measure

100 square millimeters (sq. mm.)	= 1 square centimeter (sq. cm.)
100 square centimeters	= 1 square decimeter (sq. dm.)
100 square decimeters	= 1 square meter (sq. m.)
100 square meters	= 1 square decameter (sq. Dm.)
100 square decameters	= 1 square hectometer (sq. Hm.)
100 square hectometers	= 1 square kilometer (sq. Km.)

Measures of Volume

1000 cubic millimeters (cu. mm.)	= 1 cubic centimeter (cu. cm.)
1000 cubic centimeters	= 1 cubic decimeter (cu. dm.)
1000 cubic decimeters	= 1 cubic meter (cu. m.)
1000 cubic meters	= 1 cubic decameter (cu. Dm.)
1000 cubic decameters	= 1 cubic hectometer (cu. Hm.)
1000 cubic hectometers	= 1 cubic kilometer (cu. Km.)

Measures of Capacity

10 milliliters (ml.)	= 1 centiliter (cl.)
10 centiliters	= 1 deciliter (dl.)
10 deciliters	= 1 liter (l.) = 1 cu. dm.
10 liters	= 1 decaliter (Dl.)
10 decaliters	= 1 hectoliter (Hl.)
10 hectoliters	= 1 kiloliter (Kl).

Measures of Weight

10 milligrams (mg.)	= 1 centigram (cg.)
10 centigrams	= 1 decigram (dg.)
10 decigrams	= 1 gram (g.)
10 grams	= 1 decagram (Dg.)
10 decagrams	= 1 hectogram (Hg.)
10 hectograms	= 1 kilogram (Kg.)

Comparisons

1 in.	= 2.54 cm.
1 ft.	= .3048 m.
1 yd.	= .9144 m.
1 rd.	= 5.029 m.
1 mi.	= 1.6093 Km.
1 sq. in.	= 6.452 sq. cm.
1 sq. ft.	= .0929 sq. m.

1 sq. yd.	=	.8361 sq. m.
1 sq. rd.	=	25.293 sq. m.
1 sq. mi.	=	2.59 sq. Km.
1 cu. in.	=	16.387 cu. cm.
1 cu. ft.	=	28.317 cu. dm.
1 cu. yd.	=	.7646 cu. dm.
1 qt. (2 pt.)	=	.9463 l.
1 pk.	=	8.809 l.
1 bu.	=	.3524 Hl
1 gr.	=	.0648 g.
1 oz. (Troy)	=	31.103+ g.
1 oz. (avoir.)	=	28.35 g.
1 lb. (Troy)	=	.3732 Kg.
1 lb. (avoir.)	=	.4536 Kg.
1 cm.	=	.3937 in.
1 m.	=	39.37 in.
1 Km.	=	.6214 mi.
1 sq. m.	=	1.196 sq. yd.
1 cu. m.	=	1.308 cu. yd.
1 l.	=	1.0567 qt. (2 pt.)
1 g.	=	15.432 gr.
	=	.03215 oz. Troy
	=	.03527 oz. (avoir.)
1 Kg.	=	2.2046 lb. (avoir.)
1 metric ton	=	2,204.6 lb. (avoir.)

DENOMINATE NUMBERS

A **denominate number** is a concrete number whose unit of value or measure has been fixed by law or custom.

Reduction of denominate numbers is the process of changing a number, expressed in one denomination, to an equivalent expressed in another denomination. Thus, 2 feet changed to inches equal 24 inches; 3 pecks changed to quarts equal 24 quarts.

Reduction descending is changing a number from a higher to a lower denomination. Thus, 3 yards equal 9 feet, or 108 inches.

Reduction ascending is changing a number from a lower to a higher denomination. Thus, 500 cents equal 5 dollars, and 24 inches equal 2 feet.

To reduce denominate numbers to their lowest denomination.—

Examples.—**1.** Reduce 15 yd. and 2 ft. to inches.

15 yd. × 3 (3 ft.) = 45 ft. + 2 ft. = 47 ft.

To reduce 15 yd. to ft. multiply by 3 (3 ft. in a yard), This gives 45 ft. To 45 ft. add 2 ft. The result is 47 ft. Now, 47 ft. × 12 (12 in. in 1 ft.) = 564 in. Therefore. in 15 yd., 2 ft. there are 564 in.

2. Reduce 3 bu., 3 pk., 5 qt., 1 pt. to pints.

3 bu. × 4 × 8 × 2	= 192 pt.
3 pk. × 8 × 2	= 48 pt.
5 qt. × 2	= 10 pt.
	1 pt.
	251 pt.

Reduce each denomination to pints, as shown in the illustration, and find the total. The result is 251 pt.

Problems

Reduce the following to the lowest denomination given:

1. 6 rd., 4 yd., 2 ft., 7 in.
2. 9 lb., 10 oz., 12 gr., Troy
3. 15 lb., 2 pwt.
4. 4 bu., 3 pk., 2 qt.
5. 3 gal., 2 qt., 1 pt., 3 gi.
6. 4 cu. yd., 12 cu. ft., 712 cu. in.
7. 15 lb., 4 oz., 2 dr.
8. 3 hr., 27 mi., 35 sec.

To reduce denominate numbers to higher denominations.—

Example.—Reduce 2128 in. to higher denominations.

12 | 2128	
3 |	177 ft., 4 in. remaining
5½ |	59 yd.
|	10 rd., 4 yd.

Result: 10 rd., 4 yd., 4 in.

First divide by 12 (12 in. in a ft.). The result is 17 ft., and 4 in. remaining. Then divide by 3 (3 ft. in a yd.). The result is 59 yd. Then divide by $5\frac{1}{2}$ ($5\frac{1}{2}$ yd. in a rd.).

Problems

Reduce to higher denominations:

1. 66578 in.	**4.** 864 pt., dry.	**7.** 12854 sq. in.
2. 1286 gi.	**5.** 998 gr., Troy.	**8.** 363879 cu. in.
3. 384754 sec.	**6.** 5652 gr., Apothecaries'.	**9.** 12268 pwt.

To reduce fractional denominate numbers to lower denominations.—

Example.—Reduce $\frac{5}{8}$ gal. to lower denominations.

$\frac{5}{8} \times 4$ qt. $= \frac{20}{8} = 2\frac{1}{2}$ qt.
$\frac{1}{2} \times 2$ pt. $= 1$ pt.
Result: $\frac{5}{8}$ gal. $= 2$ qt., 1 pt.

There are 4 qt. in a gal. In $\frac{5}{8}$ of a gal. there are $\frac{5}{8} \times 4$ qt., or $2\frac{1}{2}$ qt. There are 2 pt. in 1 qt. In $\frac{1}{2}$ qt. there is $\frac{1}{2} \times 2$ pt., or 1 pt.

Problems

Reduce to lower denominations:

1. $\frac{3}{5}$ rd.	**3.** $\frac{7}{8}$ yd.	**5.** $\frac{3}{4}$ bu.
2. $\frac{5}{8}$ lb. Troy	**4.** $\frac{3}{8}$ days	**6.** $\frac{9}{16}$ sq. yd.

To reduce denominate numbers to a fraction of a higher denomination.—

Example.—Reduce 8 qt., 1 pt. to the fraction of a bushel.

$4 \times 8 \times 2 = 64$ pt. in 1 bu.
$8 \times 2 + 1 = 17$ pt.
$17 \div 64 = \frac{17}{64}$ bu.

The pint is the lowest denomination given. But 8 qt. + 1 pt. = 17 pt. Divide 17 by 64 (1 bu. = 64 pt.). Result: 8 qt., 1 pt. $= \frac{17}{64}$ bu.

Problems

1. Reduce to 3 hr., 10 min. to the fraction of a day.

2. Reduce 8 rd., 3 yd. to the fraction of a mile.

3. Reduce 1 pt., 3 gi. to the fraction of a gallon.

4. Reduce 7 pwt., 12 gr. to the fraction of a pound.

5. Reduce 4 dr., 3 sc. to the fraction of a pound.

6. Reduce 40 sq. rd., 12 sq. yd. to the fraction of an acre.

To reduce fractional denominate numbers to a fraction of a higher denomination.—

Example.—Reduce $\frac{5}{8}$ ft. to the fraction of a rod.

$\frac{5}{8} \div 3$ ft. $= \frac{5}{24}$ yd.
$\frac{5}{8} \times \frac{1}{3} = \frac{5}{24}$
$\frac{5}{24} \div 5\frac{1}{2} = \frac{5}{132}$ rd.
$\frac{5}{24} \times \frac{2}{11} = \frac{10}{264}$, or $\frac{5}{132}$, rd.

Divide $\frac{5}{8}$ by 3 (3 ft. in a yd.). Divide the result, $\frac{5}{24}$, by $5\frac{1}{2}$ ($5\frac{1}{2}$ yd. in a rd.). The result is $\frac{5}{132}$ rd.

Problems

1. Reduce $\frac{3}{8}$ pt. to the fraction of a gallon.
2. Reduce $\frac{7}{8}$ yd. to the fraction of a rod.
3. Reduce $\frac{1}{4}$ dr. to the fraction of a pound.
4. Reduce $\frac{8}{9}$ gr. to the fraction of a pound, Troy.
5. Reduce $\frac{3}{16}$ hr. to the fraction of a day.
6. Reduce $\frac{5}{8}$ cu. ft. to the fraction of a cord.

To reduce denominate numbers to a decimal of a higher denomination.—

Example.—Reduce 1 pk., 5 qt., 1 pt. to the decimal of a bushel.

2	1
	$\frac{1}{2}$ or $.5 + 5 = 5.5$
8	5.5
	$.6875 + 1 = 1.6875$
4	1.6875

.421875 bu.

Divide 1 pt. by 2 (2 pt. in a qt.). The result is $\frac{1}{2}$, or .5, qt. Add 5 qt., then divide by 8 (8 qt. in a pk.). The result is .6875 pk. Add 1 pk. and .6875 pk., and then divide by 4. The result is .421875 bu.

Problems

1. Reduce 2 qt., 1 pt. to the decimal of a gallon.
2. Reduce 5 oz., 8 pwt., 12 gr. to the decimal of a pound.
3. Reduce 4 hr., 30 min., 30 sec. to the decimal of a day.

4. Reduce 2 pk., 4 qt., 1 pt. to the decimal of a bushel.
5. Reduce 12s. 6d., 2 far. to the decimal of a pound.
6. Reduce 3 sq. ft., 72 sq. in. to the decimal of a sq. yd.

To reduce a decimal of a denominate number to lower denominations.—

Example.—Reduce .35 lb., apothecaries', to lower denominations.

$$\begin{aligned} .35 \times 12 &= 4.20 \\ .20 \times 8 &= 1.6 \\ .6 \times 3 &= 1.8 \\ .8 \times 20 &= 16.0 \end{aligned}$$

Multiply .35 lb. by 12 (12 oz. in 1 lb.). The result is 4.20 oz. Multiply .20 oz. by 8 (8 dr. in 1 oz.). The result is 1.6 dr. Multiply .6 dr. by 3 (3 sc. in 1 dr.). The result is 1.8 sc. Multiply .8 sc. by 20 (20 gr. in 1 sc.). The result is 16 gr. Total result: 4 oz., 1 dr., 1 sc., 16 gr.

Problems

Reduce to lower denominations:

1. .48 lb. Troy
2. .76 rd.
3. .27 sq. yd.
4. .65 gal.
5. .56 sq. rd.
6. .625 mi.

To reduce a decimal of a denominate number to a decimal of a higher denomination.—

Example.—Reduce .58 gi. to gallons.

$$\begin{aligned} .58 \text{ gi.} \div 4 &= .145 \text{ pt.} \\ .145 \div 2 \text{ pt.} &= .725 \text{ qt.} \\ .725 \div 4 \text{ qt.} &= .18125 \text{ gal.} \end{aligned}$$

Divide .58 gi. by 4 (4 gi. in 1 pt.). The result is .145 pt. Divide .145 by 2 (2 pt. in 1 qt.). The result is .725 qt. Divide .725 qt. by 4 (4 qt. in 1 gal.). The result is .18125 gal.

Problems

Reduce to higher denominations:

1. .38 hrs. to days
2. .45 rd. to mi.
3. .96 pwt. to lb., Troy
4. .75 dr. to lb., apothecaries'

Addition of Denominate Numbers

Example.—Add: 7 lb., 4 oz., 12 pwt., 8 gr.; 4 lb., 7 oz., 10 pwt., 12 gr.; and 11 lb., 9 oz., 17 pwt., 14 gr.

7 lb., 4 oz., 12 pwt., 8 gr.
4 lb., 7 oz., 10 pwt., 12 gr.
11 lb., 9 oz., 17 pwt., 14 gr.
23 lb., 10 oz., 0 pwt., 10 gr.

In arranging denominate numbers for adding, place like units under like units (pounds under pounds, ounces under cunces, etc.). Begin with the lowest denomination. The sum of the gr. is 34. Dividing 34 gr. by 24 (24 gr. = 1 pwt.) gives 1 pwt. and 10 gr. remaining. Add the 1 pwt. to the pwt. column. The result is 40 pwt. Dividing 40 pwt. by 20 (20 pwt. = 1 oz.) gives 2 oz. and 0 pwt. remaining. Add the 2 oz. to the oz. column. The result is 22 oz. Dividing 22 oz. by 12 (12 oz. = 1 lb.) gives 1 lb. and 10 oz. remaining. Add the 1 lb. to the lb. column. The result is 23 lb., 10 oz., 10 gr.

Problems

Add:

1. 4 lb., 7 oz., 14 pwt., 16 gr.
9 lb., 10 oz., 17 pwt., 18 gr.
16 lb., 8 oz., 15 pwt., 20 gr.

2. 8 rd., 3 yd., 2 ft., 4 in.
7 rd., 5 yd., 1 ft., 7 in.
15 rd., 4 yd., 2 ft., 9 in.

3. 5 lb., 6 oz., 7 dr., 2 sc., 16 gr.
7 lb., 5 oz., 4 dr., 2 sc., 10 gr.
12 lb., 9 oz., 5 dr., 1 sc., 12 gr.

4. 6 gal., 3 qt., 1 pt., 2 gi.
15 gal., 3 qt., 2 gi.
12 gal., 1 qt., 1 pt., 3 gi.

5. 1 mi., 265 rd., 3 yd., 9 in.
4 mi., 120 rd., 2 yd., 2 ft., 7 in.

Subtraction of Denominate Numbers

Example.—From 2 yr., 8 mo., 12 days, 8 hr., 40 min., 28 sec. subtract 1 yr., 9 mo., 16 days, 3 hr., 45 min., 30 sec.

2 yr., 8 mo., 12 days, 8 hr., 40 min., 28 sec.
1 yr., 9 mo., 16 days, 3 hr., 45 min., 30 sec.
0 yr., 10 mo., 26 days, 4 hr., 54 min., 58 sec.

Place like units under like units. Now, 30 sec. cannot be taken from 28 sec., so that it is necessary to borrow 1

min., or 60 sec., from the minutes column. Add the 60 sec. to 28 sec., and from this sum subtract 30 sec. The result is 58 sec. But 1 min. was borrowed from 40 min. leaving 39 min. From this, 45 min. cannot be taken. Borrow 1 hr., or 60 min., add to 39 min., and from the sum subtract 45 min. The result is 54 min. But 1 hr. has been borrowed from 8 hr., leaving 7 hr. From 7 hr. subtract 3 hr. The result is 4 hr. Now, 16 days cannot be taken from 12 days. Borrow 1 mo., or 30 days. Add 30 days to 12 days and from this sum subtract 16 days. The result is 26 days. Further, 9 mo. cannot be taken from the 7 mo. remaining. Borrow 1 yr., or 12 mo., add 12 to 7 mo. and from this sum subtract 9 mo. The result is 10 mo. Taking 1 year from 1 year remaining leaves 0. The result is 10 mo., 26 days, 4 hr., 54 min., and 58 sec.

Problems

1. From 12 bu., 2 pk., 5 qt. subtract 7 bu., 3 pk., 6 qt., 1 pt.

2. From 5 days subtract 2 days, 5 hr., 28 min., 17 sec.

3. From 2 mi., 180 rd., 3 yd., 9 in. subtract 1 mi., 216 rd., 4 yd., 2 ft., 11 in.

4. From a barrel containing 28 gal., 2 qt., there were sold 17 gal., 3 qt., 1 pt. How much remains?

5. From 78 A., 97 sq. rd., 18 sq. yd. subtract 16 A., 116 sq. rd., 21 sq. yd.

Multiplication of Denominate Numbers

Example.—Multiply 28 sq. rd., 12 sq. yd., 6 sq. ft., 37 sq. in. by 7.

sq. rd.	sq. yd.	sq. ft.	sq. in.
28	12	6	37
			7
196	84	42	259
198	27	7	115
	½	15	18
198	27	22	133
198	29	4	133

Arrange the problem as illustrated. Multiply each denomination by 7, and place the results in position. 259

sq. in. are equal to 1 sq. ft., and 115 sq. in. remaining. 42 sq. ft. + 1 = 43 sq. ft. = 4 sq. yd., and 7 sq. ft. remaining. 84 sq. yd. + 4 sq. yd. = 88 sq. yd. = 2 sq. rd., with 27 sq. yd. remaining. 196 sq. rd. + 2 sq. rd. = 198 sq. rd. Change $\frac{1}{2}$ sq. yd. to 15 sq. ft., 18 sq. in. and adjust the result by adding, as illustrated. The final result is 198 sq. rd., 29 sq. yd., 4 sq. ft., 133 sq. in.

Problems

1. Multiply 6 mi., 84 rd., 3 yd., 2 ft., 7 in. by 12.

2. A merchant bought 9 kegs of cider, each keg containing 5 gal., 2 qt., 1 pt. He sold this cider at 12¢ a quart. What was the total price which he received?

3. A farmer sold, for $1.75 a bu., 24 bags of wheat, each bag containing 2 bu., 1 pk., 1 qt. For how much did he sell the wheat?

4. A man motored 16 days at an average of 9 hr., 27 min. a day. (a) How long was he motoring? (b) At an average speed of 25 miles an hour, how far did he travel?

5. A dealer bought 2 doz. silver spoons, each spoon weighing 4 oz., 3 pwt., 8 gr. (a) Find the total weight of the spoons; (b) the total cost at $7\frac{1}{2}$¢ a pwt.

Division of Denominate Numbers

Example.—Divide 16 A., 120 sq. rd., 18 sq. yd. by 5.

A.	sq. rd.	sq. yd.	sq. ft.	sq. in.
5)16	120	18		
3	56	3	5	$57\frac{3}{5}$ or 57.6

As illustrated, 16 A. ÷ 5 = 3 A. and 1 A. remaining. 1 A. = 160 sq. rd. + 120 sq. rd. ÷ 5 = 56 sq. rd. 18 sq. yd. ÷ 5 = 3 sq. yd. and 3 sq. yd. remaining. 3 sq. yd. = 27 sq. ft. (9 sq. ft. × 3). 27 ÷ 5 = 5 sq. ft. and 2 sq. ft. remaining. 2 sq. ft. = 288 sq. in. (144 sq. in. × 2). 288 sq. in. ÷ 5 = $57\frac{3}{5}$, or 57.6, sq. in.

Problems

1. Divide 12 lb., 10 oz., 6 dr. by 3.

2. Divide 8 days, 9 hr., 30 min., 28 sec. by 4.

3. Divide 18 bu., 2 pk., 6 qt., by 6.

4. Divide 8 lb., 10 oz., 14 pwt., 16 gr. by 4.

5. If 8 persons consumed 12 gal., 3 qt. of milk in 12 days, how much did each person consume on an average each day?

The Metric System

General Problems

1. Add 3 Km., 4 Hm., 7 Dm., 6 m. and 4 Km., 9 Hm., 5 Dm., 8 m.

2. Add 35 sq. Hm., 60 sq. Dm., 90 sq. m., 70 sq. dm. and 40 sq. Hm. 90 sq. Dm., 60 sq. m., 50 sq. dm.

3. From 40 Dg., 8 g., 5 dg., 6 cg., take 28 Dg., 9 g., 4 dg., 8 cg.

4. Multiply 8 l., 7 dl., 4 cl., by 10

5. Multiply 24 Hm., 6 Dm., 3 m., 7 dm. by 15

6. Divide 24 Km., 8 Dm., 4 m., 8 dm., by 8

7. Divide 36 l., 7 dl., 5 cl. by 3

8. (a) Change 2600 cm. to m.; (b) to Dm.

9. Change 8 Km., 5 Hm., 3 Dm. to m.

10. Reduce 9000 sq. m. to sq. Hm.

COMPARISON OF WEIGHTS AND MEASURES

To change weights and measures to other equivalent units.—

Example.—Change 20 pounds Troy to avoirdupois pounds. (See comparative tables of weights and measures, page 75.)

$$\frac{5760 \text{ oz.} \times 20}{7000} = \frac{576}{35} = 16\tfrac{16}{35} \text{ lb.}$$

There are 5760 gr. in the pound Troy, and 7000 gr. in the pound avoirdupois. To change 20 pounds Troy to avoirdupois pounds, multiply 5760 gr. by 20, and divide the product by 7000. (7000 gr. = 1 lb. avoir.) The result is $16\frac{16}{35}$ avoirdupois pounds.

Problems

1. Change 24 lb., apothecaries', to avoirdupois pounds.

2. Change 45 lb., avoirdupois, to Troy pounds.

3. Change 15 Kg. to pounds.

4. Change 100 long tons to short tons.
5. Change 150 meters to yards.
6. Change 35 dry gallons to liquid gallons equal volume.
7. Change 32 liquid gallons to liters.
8. Change 40 Km. to miles.

COMPARISONS OF MONEY

To change money of one country into its equivalent in that of another.—

Examples.—**1.** Change 300 German marks to U. S. money. (Use table, p. 77.)

$$300 \times 23.8¢ = \$71.40$$

A mark is normally worth 23.8¢ in U. S. money. Therefore, 300 M. × 23.8¢ equals their value in U. S. money, or $71.40 To change U. S. money to German money, reverse the process and divide the number of dollars by 23.8¢. Thus, $71.40 ÷ 23.8¢ = 300 marks.

2. Change $480 to francs.

$$\$480 \div \$0.0391\tfrac{3}{4} = 12252.71 \text{ francs}$$

Divide $480 by $0.0391¾. (1 F. = $0.0391¾). The result is the number of francs in $480, or 12252.71 F.

3. Change £48, 12s. to U. S. money.

$$\begin{aligned} 12\text{s.} &= \tfrac{12}{20} \text{ or } £.6 \\ £48 + £.6 &= £48.6 \\ 48.6 \times \$4.8665 &= \$236.50 \end{aligned}$$

Changing the 12s. to a decimal of a pound gives £.6. Add £.6 to £48. The result, £48.6 × $4.8665 (£1 = $4.8665) = $236.50.

4. Change $500 to English money.

$$\begin{aligned} \$500 \div \$4.8665 &= £102.74324+ \\ .74324 \times 20\text{s.} &= 14.8648\text{s.} \\ .8648 \times 12\text{d.} &= 10.3776\text{d.} \\ .3776 \times 4 \text{ far.} &= 1.5104 \\ &£102, 14\text{s.}, 10\text{d.}, 2 \text{ far.} \end{aligned}$$

Divide \$500 by \$4.8665. This gives £102 and the decimal of a pound. Change the decimal £.74324, to shillings, pence and farthings as illustrated.

Problems

1. Change £88, 15s. to dollars.
2. Change 1940 francs to dollars.
3. Change 1830 marks to dollars.
4. Change \$750 to English money.
5. Change \$200 to French money.
6. Change \$450 to German money.

INVOLUTION AND EVOLUTION

Involution

Involution is the process of multiplying a quantity by itself any number of times.

A **power of a number** is the product obtained by multiplying a number by itself any number of times.

Thus, $5 \times 5 = 25$. 25 is the second power of 5. $25 \times 5 = 125$. 125 is the third power of 5. $125 \times 5 = 625$. 625 is the fourth power of 5.

The small number, written to the right and a little above the number to be raised, is called the **exponent.**

Thus, 8^2 means that 8 is to be raised to its second power ($8 \times 8 = 64$); 8^3 means that 8 is to be raised to its third power ($8 \times 8 \times 8 = 512$); and 8^4 means that 8 is to be raised to its fourth power ($8 \times 8 \times 8 \times 8 = 4096$).

The second power is called the **square** of the number; the third power is called the **cube** of the number. Other higher powers are denoted by their numbers, for example, 7^4, the fourth power of 7.

To calculate a higher power of a whole number.—

Example.—Find the fourth power of 12 (12^4).

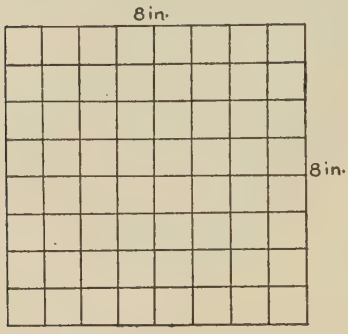
$$12 \times 12 \times 12 \times 12 = 20{,}736$$

Therefore, the fourth power of 12 (12^4) is 20,736.

Problems

1. Find the square of 33.
2. Find the cube of 17.
3. Find the fourth power of 21.
4. Find the fifth power of 9.

Example.—Find the number of square inches in one side of a block 8 in. square. 8 in. × 8 in. = 64 sq. in. Thus, there are 64 sq. in. in one side of this block. (See fig. 6.)



A square
Fig. 6.

To find the number of square units of measurement in the surface of any plane figure or flat surface, multiply the unit of length by the unit of width of the same denomination (in. by in., ft. by ft., etc.).

Problems

1. How many square feet are there in a lot 50 ft. by 100 ft.?

2. How many acres are there in a field 120 rd. square?

3. How many square yards are there in the floor of a room 18 ft. long and 12 feet wide?

To calculate a higher power of a common fraction.—

Example.—Find the fourth power of $\frac{3}{4}$.

$$\tfrac{3}{4} \times \tfrac{3}{4} \times \tfrac{3}{4} \times \tfrac{3}{4} = \tfrac{81}{256}$$

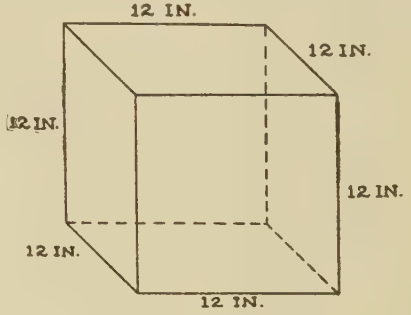
Multiply the numerator, 3, by itself four times. The result is 81. Multiply the denominator, 4, by itself four times. The result is 256. Express the powers 81 and 256 as a fraction, $\frac{81}{256}$.

Problems

1. Find the third power, or the cube, of $\frac{7}{8}$.

2. Find the fifth power of $\frac{2}{7}$.

To find the number of square units in the sides of a cube.—



A CUBE
Fig. 7.

A **cube** is a solid having six equal square faces.

Example.—Find the number of square inches in the six exposed sides of a cube, each side of which is 12 in. square.

Every cube has six exposed surfaces. The surface of this cube may be found by multiplying $12 \times 12 \times 6 = 864$. Thus, there are 864 sq. in. in the six exposed surfaces of the cube. (See fig. 7.)

To find the cubical contents of a cube.—

Example.—To find the cubical contents of the cube illustrated, raise its one dimension, 12 in., to the third power. Thus, 12 in. $\times$ 12 in. $\times$ 12 in. = 1728 cu. in., the contents of a block 12 in. long, 12 in. wide, and 12 in. thick. There are 12 in. in a foot; therefore, we have proved that there are 1728 cu. in. in 1 cu. ft.

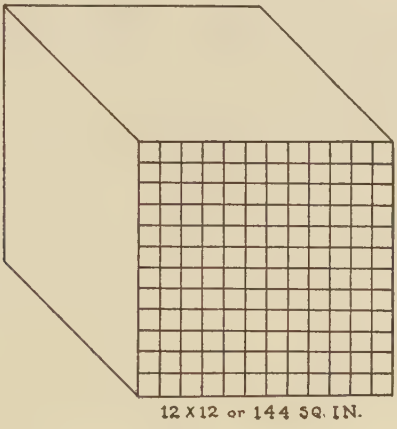


Fig. 8a.

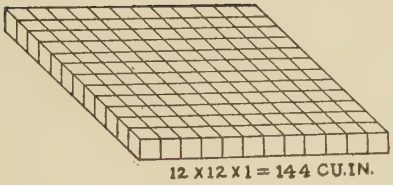


Fig. 8b.

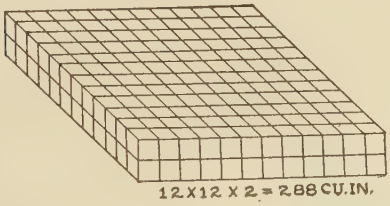


Fig. 8c.

By fig. 8a we see that there are 12 times 12, or 144 sq. in. in one exposed surface of this cube. Therefore, in a surface 12 in. by 12 in. and 1 in. thick there are 144 cu. in.

$(12 \times 12 \times 1)$ (fig. 8b). For each additional inch of thickness there would be 144 additional cubic inches ($12 \times 12 \times 2 = 288$, etc.) (fig. 8c). Hence, 12 in. $\times$ 12 in. $\times$ 12 in. equals 1728 cu. in., which are the cubical contents of a 12 in. cube.

Problems

1. Find the number of square feet in the six exposed surfaces of a block of marble 3 ft. long, 2 ft. wide, and 2 ft. thick.

2. Find the number of cubic feet in a cut stone 4 ft. long, 2 ft. wide, and 3 ft. thick.

Evolution

Evolution is the process of finding what number was multiplied by itself two or more times to produce a certain power. It is the reverse of **involution.**

The **root** of a number is that number which was multiplied by itself two or more times to produce a certain number or power.

Thus, 8 is the square root of 64 ($8 \times 8 = 64$); 5 is the cube root of 125 ($5 \times 5 \times 5 = 125$); 3 is the fourth root of 81 ($3 \times 3 \times 3 \times 3 = 81$).

The root of a number is always one of the equal factors of that number.

The radical sign ($\sqrt{}$), when placed above a number, indicates that the root of that number is to be extracted.

Thus, $\sqrt{25}$ indicates that the square root is to be extracted.

$\sqrt[3]{125}$ indicates that the cube root is to be extracted.

$\sqrt[4]{625}$ indicates that the fourth root is to be extracted.

When the root of a number can be extracted without leaving a remainder, the number is a **perfect power.**

When the root of a number cannot be extracted exactly, the number is an **imperfect power.**

To find the square root of a whole number.—

Example.—What is the length of one side of a square field, the area of which is 7225 sq. rd.?

		85	
	8	72.25	80
	Trial div.	64	5
$80 \times 2 =$	160	825	85
	$\times 5$	825	
	800		
$5 \times 5 =$	25		
	825		

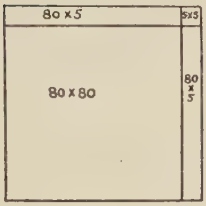


Fig. 9.

$80 \times 80 = 6400$

$80 \times 5 = 400$

$80 \times 5 = 400$

or

$(160 \times 5 = 800)$

$5 \times 5 = 25$

7225

1. Beginning at the decimal point, point off the number into periods of two places each. (72.25)

2. Find the largest perfect square which may be taken from the left-hand period (72). ($8 \times 8 = 64$, the largest perfect square that can be taken from 72). As there are two periods in the number (72.25), the first whole number of the root is 80 ($80 \times 80 = 6400$). (See fig. 9.)

3. For a trial divisor, double the root already found ($80 \times 2 = 160$). As a trial, 825 divided by 160 gives 5 as the largest possible whole number (root). Multiply 160 by 5, and to this result add the square of this number ($5 \times 5 = 25$). $160 \times 5 = 800 + 25 = 825$. (See fig. 9.) When there are more periods, continue the solution by the same process.

4. When the power is a perfect square, there will be no remainder. When the power is not a perfect square and a decimal is the result, it is necessary to annex two ciphers at a time and continue the solution by the same process to three decimal places.

Problems

1. The floor space in a certain square room contains 576 sq. ft. What is the length of one side of this room?

2. A square park contains 5184 sq. rd. What is the length of one side of this park?

3. The top of a square table contains 2304 sq. in. What is the length, in feet, of one side of this table?

4. If 225 sq. yd. of linoleum are required to cover the floor of a square room, what is the length, in feet, of one side?

5. Find the square root of 24.756. Carry the result to three decimal places.

To find the square root of a common fraction.—

Example.—Find the square root of $\frac{3}{4}\frac{6}{9}$.

$$\sqrt{36} = 6 \quad \sqrt{49} = 7 \quad \text{The result is } \tfrac{6}{7}.$$

To find the square root of a common fraction, first find the square root of its numerator, and then find the square root of its denominator. Express the results as a fraction, using the roots in their respective order as numerator and denominator.

Problems

Find the square roots of the following:

1. $\frac{16}{25}$ 2. $\frac{49}{64}$ 3. $\frac{121}{144}$ 4. $\frac{225}{256}$

PRACTICAL MEASUREMENTS

Practical measurements have many definite applications and uses, which will be determined as this work progresses.

Fig. 10a.—Horizontal Straight Line.

The shortest distance between two points is a **straight line.** A line has length, but not breadth or thickness.

Fig. 10b.—Parallel Lines.

Fig. 10c.—Perpendicular Line.

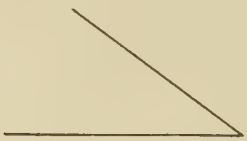


Fig. 10d.—Angle.

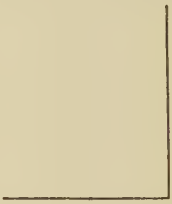


Fig. 10e.—Right Angle.

An **angle** is the opening between two straight lines which meet at a point.

Parallelograms

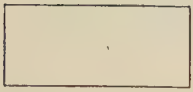


Fig. 11a.—Rectangle.

Fig. 11b.—Square.

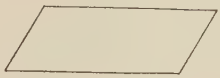


Fig. 11c.—Rhomboid.

Fig. 11d.—Rhombus.

A **surface** has length and breadth, but not thickness.

A **rectangle** is a plane figure which has four right angles.

A **trapezoid** is a plane figure which has two of its four sides parallel.

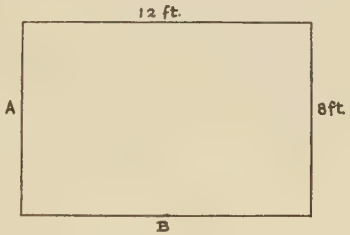
A **quadrilateral** is a plane surface having four sides and four angles.

A **parallelogram** is a quadrilateral having its opposite sides parallel.

A **square** is a rectangle having four equal sides.

A **rhombus** is an equilateral parallelogram having its angles oblique.

A **rhomboid** is a parallelogram with oblique angles and the adjacent sides unequal.



a = altitude
b = base

Fig. 12.—Rectangle.

To find the area of a rectangle.—

Example.—Find (a) the perimeter and (b) the area of a rectangle 12 ft. long and 8 ft. wide. (The perimeter of a surface is the combined length of its four sides.)

12 ft. + 12 ft. + 8 ft. + 8 ft. = 40 ft., the perimeter
12 ft. × 8 ft. = 96 sq. ft., the area.

The area of any parallelogram is the product of its length (base) *and width* (altitude).

Problems

1. How many square yards are there in a garden plot 60 ft. by 40 ft.?

2. How many acres are there in a rectangular field 120 rd. long and 80 rd. wide?

3. How much will it cost at $1.85 a rod to fence a square field containing 40 acres?

4. If a field containing 24 acres is 60 rods wide, how long is it?

To find the area of a trapezoid.—

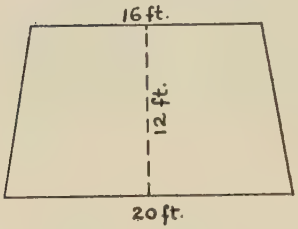


Fig. 13.—Trapezoid.

Example.—Find the area of a trapezoid, the sides of which are 20 ft. and 16 ft., and the altitude of which is 12 ft. (The altitude is the distance between the two parallel sides.)

20 ft. + 16 ft. = 36 ft.
36 ft. ÷ 2 = 18 ft.
18 ft. × 12 ft. = 216 sq. ft.

To find the area of a trapezoid, multiply $\frac{1}{2}$ *the sum of its two sides by its altitude.*

Problems

1. How many square inches are there in the surface of a piece of sheet tin 18 in. long on one side, 24 in. long on the other side, and with a distance of 14 in. between the two sides?

2. A cement walk leading up to a house is 4 ft. wide at one end and 16 ft. wide at the other, and its length is 25 ft. How many square feet does it contain?

Triangles

Fig. 14a.—Equilateral Triangle.

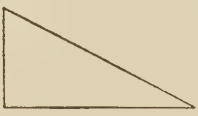


Fig. 14b.—Right Triangle.

Fig. 14c.—Isosceles Triangle.

Fig. 14d.—Acute Triangle.

Fig. 14e.—Scalene Triangle.

Fig. 14f.—Obtuse Triangle.

A **triangle** is a plane figure which has three sides and three angles.

An **equilateral triangle** has all its sides and all its angles equal.

A **right-angled triangle** has one right angle.

An **isosceles triangle** has two sides and two angles equal.

An **acute triangle** is a triangle in which each angle is less than a right angle.

A **scalene triangle** is one in which the sides and angles are unequal.

An **obtuse triangle** is a triangle which has one angle greater than a right angle.

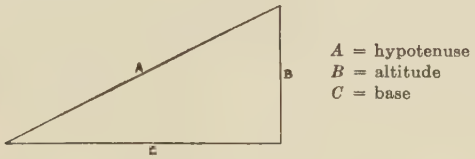


Fig. 15.—Right Triangle.

The **hypotenuse** of a right-angled triangle is the straight line opposite the right angle.

The **base** is the straight line on the side on which the figure stands.

The **altitude** is the perpendicular line from the base upward to the highest point.

To find the area of a triangle.—

Example.—Find the area of a triangle having an altitude of 6 ft. and a base of 8 ft.

A rectangle 8 ft. by 6 ft. would contain 48 sq. ft. A triangle with an altitude of 6 ft. and a base of 8 ft. contains 24 sq. ft., or $\frac{1}{2}$ as many square feet as a rectangle 6 ft. by 8 ft. (See fig. 16.)

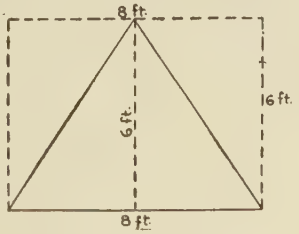


Fig. 16.

To find the area of any triangle, find the product of its base and altitude, and divide by 2.

Problems

1. Find the area of a triangular piece of cement walk having a base of 21 ft. and an altitude of 14 ft.

2. Find the area of a triangular plot of ground having a base of 12 rd. and an altitude of 8 rd.

3. How many acres are there in a triangular field having a base 60 rd. long and an altitude 46 rd. long?

4. How many square inches will there be in the largest equilateral triangle that can be cut from a piece of board 14 in. square?

Example.—Find the number of acres in a triangular plot of land, the sides of which measure 80 rd., 60 rd., and 40 rd., respectively.

$80 + 60 + 40$	$= 180$	$90 \times 10 \times 30 \times 50$	$=$	1,350,000
$180 \div 2$	$=$	$90\sqrt{1{,}350{,}000}$	$=$	1161.895 sq. rd.
$90 - 80$	$= 10$	1161.895 sq. rd. $\div$ 160	$=$	7 A., 41.895 sq. rd.
$90 - 60$	$= 30$	.895 sq. rd.	$=$	$27.073\frac{3}{4}$ sq. yd.
$90 - 40$	$= 50$	$.073\frac{3}{4}$ sq. yd.	$=$	$.663\frac{3}{4}$ sq. ft.
		$.663\frac{3}{4}$ sq. ft.	$=$	95.580 sq. in.

Find the sum of the three sides and divide by 2. The result is 90. From 90 subtract each side of the triangle. The remainders are 10, 30, and 50. Multiply 90 and all the remainders, 10, 30, and 50, together. The result is 1,350,000. Extract the square root ($\sqrt{1{,}350{,}000}$). The result is 1161.895 sq. rd. Divide 1161.895 sq. rd. by 160 (160 sq. rd. = 1 A.). The result is 7 A., 41.895 sq. rd. Now, .895 sq. rd. is equal to $27.073\frac{3}{4}$ sq. yd., of which $.073\frac{3}{4}$ sq. yd. is equal to $.663\frac{3}{4}$ sq. ft., or 95.580 sq. in. The final result is: 7 A., 41 sq. rd., 27 sq. yd., and 95.580 sq. in.

Problems

1. Find the number of square feet in a sail cloth (boat sail), the sides of which are 22 ft., 20 ft., and 18 ft., respectively. Carry the result to two decimal places.

2. Find the number of square rods in a triangular-shaped yard, the sides of which are 12 rd., 10 rd., and 8 rd., respectively.

3. Find the number of acres in a triangular field, the sides of which are 20 rd., 24 rd., and 36 rd., respectively.

4. Find the number of square feet of stone required to pave a corner plot, the sides of which are 12 ft., 14 ft., and 16 ft., respectively.

To find the hypotenuse of a right-angled triangle, when the base and altitude are given.—

Example.—Find the hypotenuse of a right-angled triangle, which has a base of 12 ft. and an altitude of 8 ft. (See fig. 17.)

$12^2(12 \times 12) = 144$
$8^2(8 \times 8) = 64$
$144 + 64 = 208$
$\sqrt{208} = 14.42$ ft., the hypotenuse

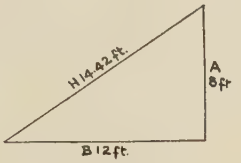


Fig. 17.

To find the hypotenuse of a right-angled triangle when the base and altitude are given, extract the square root of the sum of the square of the base and the square of the altitude.

Problems

1. Find the hypotenuse of a right-angled triangle that has an altitude of 12 ft. and a base of 16 ft.

2. How many feet are there around the outside of a right angled triangular park which has an altitude of 300 ft. and a base of 400 ft.?

3. At $4 a rod, how much will it cost to fence a right angled triangular plot whose altitude is 600 ft. and whose base is 800 ft.?

4. A field in the shape of a rectangle is 20 rods long and 15 rods wide (a) How far is it from one corner of this field directly across to the farthest corner? (b) How many acres are there in this field?

To find the altitude of a right-angled triangle when the hypotenuse and base are given.—

Example.—Find the altitude of a right-angled triangle whose hypotenuse is 20 ft. and whose base is 16 ft. (See fig. 18.)

Fig. 18.

$20^2(20 \times 20) = 400$
$16^2(16 \times 16) = 256$
$400 - 256 = 144$
$\sqrt{144} = 12$ ft., the altitude.

When the hypotenuse is given, either side of a right-angled triangle is found by extracting the square root of the difference between the square of the hypotenuse and the square of the given side.

Problems

1. Find the base of a right-angled triangle whose hypotenuse is 25 yd. and altitude 15 yd.

2. Find the area of a right-angled triangle whose hypotenuse is 40 rd. and base 32 rd.

3. Find the altitude and area of a right-angled triangle whose hypotenuse is 50 ft. and base 30 ft.

4. How long must a ladder be in order that, when it is placed 8 ft. from the side of a building 36 ft. high, it will reach the top of the building? Find the length of the ladder to the nearest whole number of feet.

To find the altitude of an equilateral triangle when the sides are given.—

Example.—Find the altitude of an equilateral triangle each of whose sides is 8 ft. (See fig. 19.)

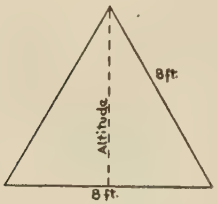


Fig. 19.

8 ft. × 8 ft.	= 64 sq. ft.
8 ft. ÷ 2	= 4 ft.
4 ft. × 4 ft.	= 16 sq. ft.
64 sq. ft. − 16 sq. ft.	= 48 sq. ft.
$\sqrt{48}$	= 6.928 ft.

Square one side (8 ft. × 8 ft.). The result is 64 sq. ft. Square $\frac{1}{2}$ the base (4 ft. × 4 ft.). The result is 16 sq. ft. But 64 sq. ft.—16 sq. ft. = 48 sq. ft. Extract the square root of 48. The result is 6.628 ft., the altitude.

Problems

1. Find the altitude of an equilateral triangle 12 ft. on each side.

2. An equilateral triangle is 16 ft. on each side. Find (a) its perimeter, (b) its altitude.

Polygons

5-sided

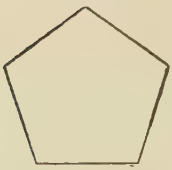


Fig. 20a.—Pentagon.

6-sided

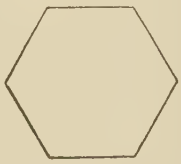


Fig. 20b.—Hexagon.

7-sided

Fig. 20c.—Heptagon.

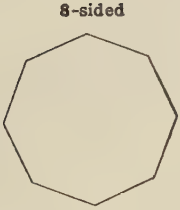


Fig. 20d.—Octagon.

Fig. 20e.—Nonagon.

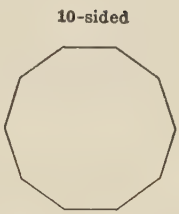


Fig. 20f.—Decagon

A **polygon** is a many-sided plane figure.

The **perimeter** of a polygon is the sum of all its sides.

The **radius** of a regular polygon is the distance between any vertex and the center.

The **apothem** is the shortest (perpendicular) distance from the center to any side.

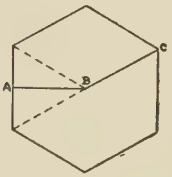


Fig. 21.

A regular polygon can be divided into as many equal triangles as it has sides. The apothem of a polygon is the altitude of each of its triangles. *Therefore, the area of a regular polygon is equal to one-half the product of its perimeter and apothem.*

To find the area of a polygon.—

Example.—Find the area of a flower bed in the shape of a hexagon, whose sides are 10 ft. and whose apothem is 8 ft., 8 in. ($8\frac{2}{3}$ ft.). Now, $6 \times 10 = 60$ ft., the perimeter. Therefore, $\frac{60 \text{ ft.} \times 8\frac{2}{3} \text{ ft.}}{2} = 260$ sq. ft., the area.

Problems

1. The perimeter of a regular octagon is 48 in., and the apothem is $7\frac{1}{4}$ in. What is the area?

2. The sides of a regular hexagon are 6 ft. and the apothem is $5\frac{1}{2}$ ft. What is the area?

3. The area of a regular octagon is 174 sq. ft. If the length of one side is 6 ft., what is its apothem?

Circles

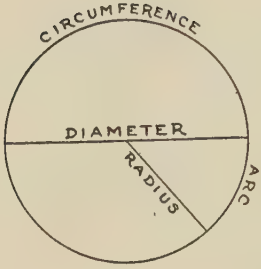


Fig. 22.

A **circle** is a plane surface enclosed by a curved line (the **circumference**), every point of which is the same distance from a point within called the **center.**

The **diameter** of a circle is a straight line drawn through the center from side to side.

The **radius** of a circle is a straight line drawn from any point on the circumference to the center.

An **arc** of a circle is any part of its circumference.

To find the circumference of a circle when the diameter is given.—

By actual measurement, it has been found that the circumference of a circle is 3.1416 times the diameter. Therefore, *to find the circumference of a circle when the diameter is given, multiply the diameter by* 3.1416.

Example.—Find the circumference of a circle having a diameter of 12 ft.

12 ft. × 3.1416 = 37.6992 ft., the circumference.
.6992 × 12 = 8.3904, or $8\frac{1}{3}$ inches, Approximately.

To find the diameter of a circle when the circumference is given.—

To find the diameter of a circle, divide the circumference by 3.1416.

Example.—Find the diameter of a circle having a circumference of 50.2656 feet.

50.2656 ft. ÷ 3.1416 = 16 ft., the diameter.

For many practical purposes, $3\frac{1}{7}$ may be used instead of 3.1416.

Problems

1. Find the circumference of a circle having a diameter of 27 ft.

2. Find the diameter, correct to two decimal places, of a circle having a circumference of 36 ft.

3. Find the distance from one side directly across through the center to the other side of a circular park having a circumference of 480 rd.

4. Find the circumference of the largest circle that can be made with a rope 60 ft. long, one end of which is fastened to a stake at the center of the circle.

To find the area of a circle when the diameter is given.—

Example.—Find the area of a circle 24 ft. in diameter.

(a) 24 ft. × 3.1416 = 75.3984 ft., the circumference
24 ft. ÷ 4 = 6 ft., one half the radius
75.3984 × 6 ft. = 452.3904 sq. ft., the area

or

(b) 24 ft. × 24 ft. × .7854 = 452.3904 sq. ft., the area.
(.7854 is $\frac{1}{4}$ of 3.1416)

or

(c) 12 ft. × 12 ft. = 144 sq. ft. (the radius is 12 ft.)
144 sq. ft. × 3.1416 = 452.3904 sq. ft., the area

The area of a circle can be found in any of these ways:
(a) *By multiplying the circumference by one half the radius.*
(b) *By multiplying the square of the diameter by* .7854 ($\frac{1}{4}$ *of* 3.1416).
(c) *By multiplying the square of the radius* ($\frac{1}{2}$ *the diameter*) *by* 3.1416.

Problems

1. Find the area of a circle having a diameter of 15 ft.

2. Find the area of a circle having a radius of 12 rd.

3. Find the area of a circle having a circumference of 56.5488 ft.

To find the diameter of a circle when the area is given.—

Example.—Find the diameter of a circle whose area is 63.6174 sq. ft.

63.6174 sq. ft. ÷ .7854 = 81 sq. ft.
$\sqrt{81}$ = 9 ft., the diameter

To find the diameter when the area is given, divide the area by .7854 *and extract the square root of the quotient.*

Problems

1. Find the diameter of a circle whose area is 38.4846 sq. ft.
2. Find the diameter of a circle whose area is 176.7150 sq. yd.
3. Find the radius of a circle whose area is 50.2656 sq. rd.

To find the circumference of a circle when the area is given.—

Example.—Find the circumference of a circle whose area is 28.2744 sq. yd.

28.2744 sq. yd. ÷ .7854 = 36 sq. yd.
$\sqrt{36}$ = 6 yd., the diameter
6 yd. × 3.1416 = 18.8496 yd., the circumference

To find the circumference when the area is given, first find the diameter and then multiply the diameter by 3.1416.

Problems

1. Find the circumference of a circle whose area is 19.6350 sq. ft.
2. Find the circumference of a circle whose area is 132.7326 sq. yd.

Solids

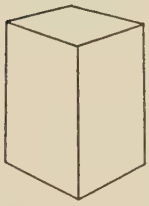


Fig. 23a.—Rectangular Prism.

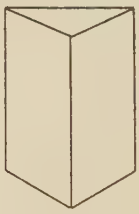


Fig. 23b.—Triangular Prism.

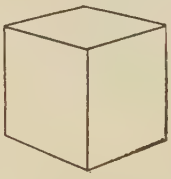


Fig. 23c.—Cube.

Fig. 23d.—Cylinder.

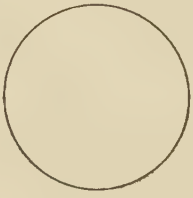


Fig. 23e.—Sphere.

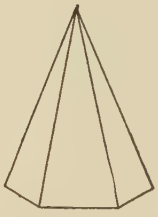


Fig. 23f.—Pyramid.

Fig. 23g.—Cone.

A **solid** has three dimensions—length, breadth, and thickness.

A **prism** is a solid whose bases are equal, similar and parallel plane figures, and whose sides are parallelograms.

A **cube** is a solid having six equal square sides and having all its angles right angles.

A **cylinder** is a circular body of uniform diameter whose bases are equal parallel circles.

A **sphere** is a solid every part of whose surface is an equal distance from a point within called the **center.**

A **pyramid** is a solid whose base is a polygon and whose sides are triangles meeting at a point called the **vertex.**

A **cone** is a solid whose base is circular and whose sides taper uniformly to a point.

To find the volume of a rectangular prism.—

Example.—Find the volume of a rectangular prism 3 ft. square and 6 ft. long. (See fig. 24.)

3 ft. × 3 ft. = 9 sq. ft.
9 × 1 cu. ft. = 9 cu. ft.
6 × 9 cu. ft. = 54 cu. ft.

or

3 ft. × 6 ft. = 18 sq. ft.
18 × 1 cu. ft. = 18 cu. ft.
3 × 18 cu. ft. = 54 cu. ft.

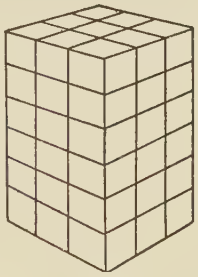


Fig. 24.

For each foot of height 3 ft. square there are 9 cu. ft. For the 6 ft. in height there are 6 × 9 cu. ft., or 54 cu. ft. Therefore, the volume of this prism is 54 cu. ft.

The volume of a prism is the product of the area of its base and its height.

Problems

1. Find the volume of a block 18 in. square and 3 ft. long.

2. Find the volume of a box, the outside measurements of which are 2 ft. by 3 ft. by 4 ft.

3. Find the volume of a bin 6 ft. deep, 8 ft. wide, and 12 ft. long.

4. Find the volume of a tank 2 ft. wide, 3 ft. deep, and 10 ft. long.

To find the volume of a triangular prism.—

Example.—Find the volume of a triangular prism the sides of whose base are 4 ft. and whose height is 6 ft.

$$
\begin{aligned}
4 \text{ ft.} \times 4 \text{ ft.} &= 16 \text{ sq. ft.} \\
4 \div 2 &= 2 \text{ ft.} \\
2 \text{ ft.} \times 2 \text{ ft.} &= 4 \text{ sq. ft.} \\
16 \text{ sq. ft.} - 4 \text{ sq. ft.} &= 12 \text{ sq. ft.} \\
\sqrt{12 \text{ sq. ft.}} &= 3.464 \text{ ft., the altitude} \\
\frac{3.464 \times 4}{2} \times 6 &= 41.568 \text{ cu. ft., the volume}
\end{aligned}
$$

Find the area of the base in square feet, and multiply this result by the height. $\frac{3.464 \times 4}{2}$ = area of the base. Multiplying by 6, we have the volume or 41.568 cu. ft.

Problems

1. Find the volume of a triangular prism, the base of which is 6 ft. on a side and the height 8 ft.

2. Find the volume of a triangular prism whose sides are 8 ft. and whose height is 12 ft.

3. Find the volume of a triangular prism whose sides are 6, 8, and 10 ft. and whose height is 9 ft.

4. Find the volume of a triangular prism, the sides of which are 10 ft. 12 ft., and 14 ft., and the height 15 ft.

To find the volume of a cube.—

Example.—Find the number of cubic feet in the volume of a cube 4 ft. wide, 4 ft. thick, and 4 ft. high.

$$
\begin{aligned}
4 \text{ ft.} \times 4 \text{ ft.} &= 16 \text{ sq. ft.} \\
16 \times 1 \text{ cu. ft.} &= 16 \text{ cu. ft.} \\
16 \text{ cu. ft.} \times 4 &= 64 \text{ cu. ft.}
\end{aligned}
$$

For each square foot one foot high, there are 16 cu. ft. The cube is 4 ft. high. Therefore, 16 cu. ft. multiplied by 4 equals 64 cu. ft., the volume.

Problems

1. Find the number of cubic feet in the volume of a cube measuring 6 ft. by 6 ft. by 6 ft.

2. Find the volume of a cube 8 ft. wide, 8 ft. deep, and 8 ft. high.

3. Find the number of square feet in the sides of a cube 3 ft. by 3 ft. by 3 ft.

4. How many square feet in the six sides of a box 3 ft. wide, 4 ft. deep, and 4 ft. long?

To find the volume of a cylinder.—

Example.—Find the volume of a cylindrical tank whose diameter is 4 ft. and whose height is 8 ft.

$$\begin{aligned} 4 \div 2 &= 2 \text{ ft. the radius} \\ 2 \times 2 \times 1 \text{ cu. ft.} &= 4 \text{ cu. ft.} \\ 4 \text{ cu. ft.} \times 3.1416 &= 12.5664 \text{ cu. ft.} \\ 12.5664 \text{ cu. ft.} \times 8 &= 100.5312 \text{ cu. ft.} \end{aligned}$$

The radius squared times 1 cu. ft. times 3.1416 gives the volume of the base for 1 ft. of height. For 8 ft. of height, the volume is 8 times 12.5664, or 100.5312 cu. ft.

The volume of a cylinder is equal to the area of its base times its height.

Problems

1. Find the volume of a well 6 ft. in diameter and 20 ft. deep.

2. Find the volume of a cistern 10 ft. in diameter and 12 ft. deep.

3. Find the volume of a pipe 18 in. in diameter and 30 ft. long. (Find the number of cubic inches and divide by 1728.)

4. Find the volume of a silo 8 ft. in diameter and 30 ft. high.

To find the area of the lateral surface of a cylinder.—

Examples.—

1. At 12¢ per square foot, what will be the cost of the sheet metal for a smoke pipe 15 in. in diameter and 24 ft. long?

$$\begin{aligned} \frac{15 \times 3.1416}{12} &= 3.9270 \text{ ft., the circumference} \\ 3.9270 \times 24 &= 94.248 \text{ sq. ft. in the sides} \\ 94.248 \times 12¢ &= \$11.31, \text{ the cost.} \end{aligned}$$

2. Find the number of square feet in the surface area of an oil tank 4 ft. in diameter and 12 ft. long.

$$4 \times 3.1416 = 12.5664, \text{ the circumference}$$
$$12.5664 \times 1\ (\tfrac{1}{2} \text{ radius}) \times 2 = 25.1328, \text{ area of the ends}$$
$$12.5664 \times 12 = 150.7968, \text{ area of the sides}$$
$$25.1328 + 150.7968 = 175.9276 \text{ sq. ft.}$$
$$= 175 \text{ sq. ft., } 133.8624 \text{ sq. in., area of the surface}$$

The circumference of a cylinder multiplied by the length will give the number of square units in the sides.

The square units in the sides, plus twice the square units in the area of one end, will give the total number of square units in the surface area.

Problems

1. Find the cost, at 20¢ per square foot, of the sheet metal for a smoke pipe 12 in. in diameter and 40 ft. long.

2. At 30¢ per square yard, how much will it cost to paint the top and sides of a tank 10 ft. in diameter and 16 ft. high?

3. How much sheet iron will it take to make 40 lengths of 2 ft. stove pipe, 6 in. in diameter, allowing $\frac{1}{2}$ in. for seams?

To find the area of the surface of a sphere.—

Example.—Find the area of the surface of a sphere having a radius of 2 ft.

$$2 \text{ ft.} \times 2 \text{ ft.} \times 4 = 16 \text{ sq. ft.}$$
$$16 \text{ sq. ft.} \times 3.1416 = 49.2656 \text{ sq. ft.}$$

The radius squared times 4 times 3.1416 gives the number of square feet in the surface of this sphere, or 49.2656 sq. ft.

Where the circumference of a sphere is given, divide the circumference by 3.1416, or $3\frac{1}{7}$. The result will be the diameter. The diameter divided by 2 gives the radius.

The area of the surface of a sphere is equal to the radius squared times 4 *times* 3.1416.

To find the volume of a sphere.—

Example.—Find the volume of the sphere in the preceding example.

$49.2656 \times \frac{1}{3} = 16.4218\frac{2}{3}$. Then $16.4218\frac{2}{3} \times 2$ ft. (the radius) $= 32.8437\frac{1}{3}$ cu. ft., the volume of a sphere having a radius of 2 ft.

The volume of a sphere is $\frac{1}{3}$ of the area of its surface, multiplied by its radius.

Problems

1. Find the number of square feet in the surface of a sphere whose radius is 3 ft.

2. Find the circumference of a sphere whose radius is 7 ft.

3. Find the volume of a sphere, the surface of which contains 452.3904 sq. ft. and the radius of which is 4 ft.

To find the volume of a pyramid.

Example.—Find the volume of a pyramid 3 ft. square and 6 ft. high.

$3 \times 3 = 9$ sq. ft., area of the base
6 ft. $\times \frac{1}{3} = 2$ ft.
9 sq. ft. $\times 2 = 18$ cu. ft., volume of pyramid

To find the volume of a pyramid, multiply the area of the base by one third of the height.

Problems

1. Find the volume of a pyramid 12 ft. high with a base 4 ft. square.

2. Find the volume of a triangular pyramid 12 ft. high whose base is 5 ft. on each side.

3. Find the volume of a pyramid 18 ft. high with a base 4 ft. by 6 ft.

To find the volume of a cone.—

Example.—Find the volume of a cone having a diameter of 4 ft. and an altitude of 8 ft.

$2 \times 2 \times 3.1416 = 12.5664$ sq. ft., the area of base.

$$\frac{12.5664 \times 8}{3} = 33.5104 \text{ cu. ft., volume of cone.}$$

To find the volume of a cone, multiply the area of the base by one third the height, or altitude.

Problems

1. Find the volume of a cone having a diameter at the base of 6 ft. and an altitude of 15 ft.

2. Find the volume of a cone having an area at the base of 12.5664 ft and an altitude of 9 ft.

3. Find the volume of a cone having a radius at the base of 3 ft. and an altitude of 18 ft.

To find the area of the lateral surface of a pyramid.—

Example.—Find the number of square feet in the lateral surface of a pyramid whose base is 5 ft. square, and whose slant height is 12 ft.

$$5 \text{ ft.} \times 4 = 20 \text{ ft., perimeter of the base}$$

$$\frac{20 \times 12}{2} = 120 \text{ sq. ft. in area of lateral surface}$$

To find the area of the lateral surface of a pyramid, multiply the perimeter of the base by one half the slant height.

Problems

1. Find the number of square feet in the lateral surface of a pyramid whose base is 4 ft. square and whose slant height is 10 ft.

2. Find the number of square feet in the lateral surface of a pyramid whose base is 6 ft. square and whose slant height is 18 ft.

To find the lateral surface of a cone.—

Example.—Find the number of square feet in the lateral surface of a cone whose diameter is 6 ft., and whose slant height is 16 ft.

$$6 \times 3.1416 = 18.8496 \text{ ft. in circumference}$$

$$\frac{18.8496 \times 16}{2} = 150.7968 \text{ sq. ft. in lateral surface}$$

To find the number of square feet in the lateral surface of a cone, multiply the perimeter of the base by one half the slant height.

Problems

1. Find the number of square feet in the lateral surface of a cone whose diameter is 4 ft. and whose slant height is 14 ft.

2. Find the number of square feet in the lateral surface of a cone whose circumference is 25.1328 ft. and whose slant height is 22 ft.

APPLIED MEASUREMENTS

Painting

Example.—How much will it cost, at 75¢ per square yard, to paint the side walls and ceiling of a room 14 ft. long, 12 ft. wide, and $8\frac{1}{2}$ ft. high, allowing for 2 windows each 3 ft. by 6 ft. and 1 door 3 ft. by 7 ft.?

$$
\begin{aligned}
(14 \text{ ft.} + 12 \text{ ft.}) \times 2 &= 52 \text{ ft., perimeter of room} \\
52 \times 8\tfrac{1}{2} &= 442, \text{ no. sq. ft. in walls} \\
14 \times 12 &= 168, \text{ no. sq. ft. in ceiling} \\
442 + 168 &= 610, \text{ no. sq. ft. in walls and ceiling} \\
(3 \times 6) \times 2 &= 36, \text{ no sq. ft. in the windows} \\
3 \times 7 &= 21, \text{ no. sq. ft. in the door} \\
21 + 36 &= 57, \text{ no. sq. ft. in door and windows} \\
610 - 57 &= 553, \text{ no. sq. ft. to be painted} \\
\frac{553 \times 75¢}{9} &= \$46.08, \text{ cost of painting (9 sq. ft. = 1 sq. yd.)}
\end{aligned}
$$

In reckoning the cost of painting, plastering, and the like, it is the practice to compute only whole units of measures. In the above problem, 62 sq. yd. at 75¢, or $46.50, would be the actual cost.

In computing the cost of painting, find the number of square yards in the surfaces to be covered and multiply by the cost per square yard.

Problems

1. Find the cost, at 70¢ per square yard, of painting the walls and ceiling of a room 18 ft. long, 16 ft. wide, and 8 ft. high, allowing for 3 windows, 3 ft. by 6 ft., and 1 door, 3 ft. by 7 ft.

2. Find the cost, at 85¢ per square yard, of painting the walls and ceiling of a room 22 ft. long, 18 ft. wide, and 9 ft. high, allowing for 4 windows, $2\frac{1}{2}$ ft. by 5 ft., and 2 doors, $3\frac{1}{2}$ ft. by 7 ft.

3. Find the cost, at 80¢ per square yard, of painting the walls and ceiling of a room 20 ft. square and $8\frac{1}{2}$ ft. high, allowing for a 6 in. cornice around the room, 4 windows, 3 ft. by 5 ft., and 2 doors, 3 ft. by 7 ft.

4. Find the cost, at 75¢ per square yard, of painting the outside of a house 36 ft. long, 24 ft. wide, and 19 ft. high to roof projections. (No allowance is made for outside openings (doors and windows), as it costs as much to paint about these openings as it would to paint the whole surface.)

Example.—Find the cost, at 90¢ per square yard, of painting the two gable ends of a house 30 ft. wide and 10 ft. from cornice to ridgepole. (See fig. 25.)

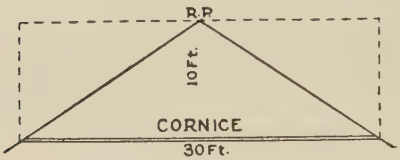


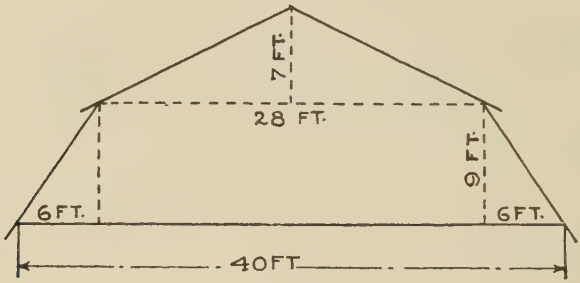
Fig. 25.

The 2 gable ends are equal to a rectangle 30 ft. by 10 ft. Therefore, $30 \times 10 \div 9 = 33\frac{1}{3}$, the number of sq. yds. in the gable ends. Then $33\frac{1}{3} \times 90¢ = \$30$, the cost of painting.

Problems

1. Find the cost, at 75¢ per square yard, of painting a house 36 ft. wide by 48 ft. long, and 18 ft. to the cornice, including the two gable ends, which measure 16 ft. from cornice to ridgepole. (No allowance for openings.)

2. Find the cost, at 30¢ per square yard, of painting the two sides of a pitched roof, 60 ft. long and $17\frac{1}{2}$ ft. from eaves to ridgepole.



A GAMBREL ROOF

Fig. 26.

3. Find the number of square feet in two gambrel roof gables of the dimensions shown in Fig. 26. What is the cost of painting their surfaces at 30¢ per square yard?

Plastering

The cost of plastering is estimated, or figured, by the square yard in the same way as painting. In figuring material for a job, allowance is made for openings; but in figuring cost of labor no definite rule is followed.

Problems

1. At \$1.20 per square yard, find the cost of plastering the walls and ceiling of a room 18 ft. long, 16 ft. wide, and 9 ft. high, allowing 66 sq. ft. for openings.

2. At \$1.35 per square yard, find the cost of plastering the walls and ceilings of 4 rooms 16 ft. long, 12 ft. wide, and 8 ft. high, allowing for $\frac{1}{2}$ the number of square feet in the area of 8 windows, 3 ft. by 5 ft., and 4 doors 3 ft. by 7 ft.

3. Find the cost of plastering a cellar ceiling 28 ft. wide and 62 ft. long, at 90¢ per square yard.

Papering

To find the number of rolls of paper required to paper a room.—

Example.—Find the cost of the paper for the walls of a room 22 ft. long, 18 ft. wide, and 8 ft. high, at \$2.80 per double roll of paper. Allow for 4 windows, 3 ft. wide, and 2 doors, 3 ft., 6 in. wide.

$$
\begin{aligned}
(22 \text{ ft.} + 18 \text{ ft.}) \times 2 &= 80 \text{ ft., perimeter of room} \\
(3 \text{ ft.} \times 4) + (3\tfrac{1}{2} \text{ ft.} \times 2) &= 19 \text{ ft., width of openings} \\
80 \text{ ft.} - 19 \text{ ft.} &= 61 \text{ ft. net perimeter of room} \\
61 \text{ ft.} \div 1\tfrac{1}{2} \text{ ft.} &= 40\tfrac{2}{3}\text{, or 41 strips required} \\
48 \text{ ft.} \div 8 \text{ ft.} &= 6\text{, the number of strips in a double roll} \\
41 \text{ strips} \div 6 \text{ strips} &= 6\tfrac{5}{6} \text{ or 7, number of rolls required} \\
7 \text{ rolls at \$2.80} &= \text{\$19.60, the cost of the paper}
\end{aligned}
$$

Paperhangers usually charge a rate by the roll or by the day for hanging paper. Where the charge is made by the roll, the price is a certain amount per single roll of 24 ft.

Example.—At \$1.30 per single roll, how much would be the amount of the bill for hanging the paper in the preceding problem?

$$
\begin{aligned}
7 \text{ double rolls} \times 2 &= 14 \text{ single rolls} \\
14 \text{ single rolls} \times \text{\$1.30} &= \text{\$18.20 the cost of hanging the paper}
\end{aligned}
$$

Most American wall paper has 24 ft. in a single roll, or 48 ft. in a double roll, and is 18 in. wide. In imported papers the width varies and the rolls also vary in length.

1. *Find the total perimeter of the room. From the total perimeter subtract the total width of the openings. This gives the net perimeter of the room.*

2. *The net perimeter of the room, divided by* 18 *in.* (*the width of a strip of paper*), *gives the number of strips required.*

3. *Dividing* 48 *ft.* (*the length of a double roll*) *by the height of the room gives the number of strips that can be cut from a double roll.* (Sometimes, however, allowance has to be made for matching the pattern in the paper.)

4. *The number of strips required, divided by the number of strips that can be cut from a roll, gives the number of rolls required.*

Problems

1. Find the cost of the paper, at \$3.60 per double roll, which is needed for a room 24 ft. long, 20 ft. wide, and $8\frac{1}{2}$ ft. high, allowing for 4 windows, 3 ft. 6 in. wide, and 2 doors, 4 ft. wide. (Base your calculations on the whole number of strips from a roll.)

2. Find the cost of papering a room 20 ft. long, 16 ft. wide, and 8 ft. high, at \$1.80 per double roll for the paper, and \$1.10 per single roll for hanging the paper. Allow for 3 windows, 3 ft. wide, and 1 door, 4 ft. wide.

3. Find the cost of papering 3 rooms, 15 ft. long, 12 ft. wide, and 8 ft. high, at \$1.20 per single roll for the paper, and \$1.25 per single roll for hanging the paper. Allow for 2 windows, 3 ft. wide, and 1 door, 4 ft. wide, in each room.

4. What would be the difference in the cost in the preceding problem had the paperhanger charged \$12.00 per day instead of \$1.25 per single roll, and had it taken him 3 days to hang the paper?

Carpeting

Carpet varies in width. The cheaper grades are usually 36 in. wide, and the better grades 27 in. wide.

While carpet may be purchased in any length desired, only whole strips can, as a rule, be purchased. In the case of a figured carpet, allowance has to be made for matching the pattern.

To find the cost of laying a carpet.—

Example.—Find the cost of an Axminster carpet, 27 in. wide ($2\frac{1}{4}$ ft.), at \$2.25 per yard, for a room 18 ft. long and 13 ft. wide, the strips to run lengthwise of the room.

13 ft. $\div$ $2\frac{1}{4}$ ft. = $5\frac{7}{9}$, or 6 strips, required

$\frac{18 \times 6}{3}$ = 36, number of yards required

36 yd., at \$2.25 per yd. = \$81, the cost

To find the number of strips required, divide the length or width of the room by the width of the carpet, depending upon which way the strips run. The length or width of the room, as the case may be, multiplied by the number of strips and divided by 3 (3 *ft. in a yd.), gives the number of yards required.*

Problems

1. Find the cost, at \$2.50 per yard, of a carpet, 27 in. wide, for a room 22 ft. long and 18 ft. wide; the strips to run lengthwise of the room.

2. Find the cost, at \$1.25 per yard, of a carpet, 1 yard wide, for a room 20 ft. long and 15 ft. wide; the strips to run the way there is the least waste.

3. Find the cost, at \$3.50 per yard, of a carpet, 27 in. wide, for a room 18 ft. square.

Paving

Paving is usually estimated, or figured, by the square foot or by the square yard.

To find the cost of paving or cement work.—

Example.—Find the cost of paving a road 1 mile long and 40 ft. wide, at \$88 per square rod.

40 ft. $\div$ $16\frac{1}{2}$ ft. = $2\frac{4}{33}$ rd., width of road

1 mile = 320 rd., length of road

320 rd. $\times$ $2\frac{4}{33}$ rd. = $775\frac{25}{33}$ sq. rd. in road

$775\frac{25}{33} \times$ \$88 = \$68,266.67, the cost of paving

Problems

1. Find the cost of paving a street 1200 ft. long and 50 ft. wide, at 65¢ per square foot.

2. Find the cost of paving a road 5 miles long and 33 ft. wide, at 75¢ per square yard.

3. Find the cost of building a cement walk 200 ft. long and 4 ft. wide, at 55¢ per square foot.

4. Find the cost, at 65¢ per square foot, of a cement walk 3 ft. wide, laid on the outside of two sides of a corner lot 125 ft. long and 40 ft. wide.

5. Find the cost, at 45¢ per square foot, of a cement walk, 4 ft. wide, around a city block 800 ft. long and 250 ft. wide. (The measurements given are the inside measurements of the walk.)

Lumber

A **board foot,** the unit of lumber measurement, is a square foot of any kind of lumber one inch thick.

To find the number of board feet in a quantity of lumber.—

Examples.—

1. How many board feet are there in 60 pieces $2'' \times 4'' \times 16'$ long $(2'' \times 4'' \times 16')$?

$$16 \times \frac{\cancel{4}}{\cancel{12}_{3}} \times 2 \times 60 = 640, \text{ the number of board feet in 60 pieces}$$

The number of board feet in a piece of lumber is found by multiplying the length in feet by the width in feet and by the thickness in inches $\left(\text{length} \times \frac{\text{width in inches}}{12} \times \text{thickness in inches}\right)$. The cancellation method can be used.

2. At $45 per thousand board feet find the cost of 80 pieces of lumber $2'' \times 6'' \times 12'$ long.

$$\cancel{12} \times \frac{6}{\cancel{12}} \times 2 \times 80 = 960, \text{ the number of board feet}$$

$$960 \times \$45 \text{ per M} = \frac{960 \times \$45}{1000} = \$43.20, \text{ the cost of the lumber}$$

Problems

1. At $56 per M find the cost of 45 pieces $2'' \times 8'' \times 16'$ long, and 60 pieces $4'' \times 4'' \times 14'$ long.

2. Find the cost at $42 per M of 240 sheathing boards $10'' \times 1'' \times 12'$ long.

3. Find the cost, at $48 per M, of 24 floor timbers, $10'' \times 2''$, and 16' long; 8 sills, $6'' \times 8''$, and 18' long; and 120 scantlings, $2'' \times 4''$, and 12' long.

4. Find the cost, at \$50 per M., of 24 floor timbers, 2″ × 10″, and 12′ long, and flooring at \$85 per M., for a room 24′ long and 20′ wide, allowing $\frac{1}{6}$ for waste and matching.

5. Find the total cost of the following bill of lumber:

30 pcs. 3″ × 8″, and 12′ long, at \$48 per M.
45 pcs. 2″ × 10″, and 16′ long, at \$51 per M.
60 pcs. 2″ × 6″, and 18′ long, at \$54 per M.
270 pcs. 2″ × 4″, and 18′ long, at \$46 per M.
1440 pcs. sheathing 1″ × 7″, and 12′ long, at \$42 per M.
1500 pcs. siding $\frac{1}{2}$″ × 6″ and 16′ long, at \$65 per M.

(Note. One inch or less in thickness is considered as one inch.)

Roofing

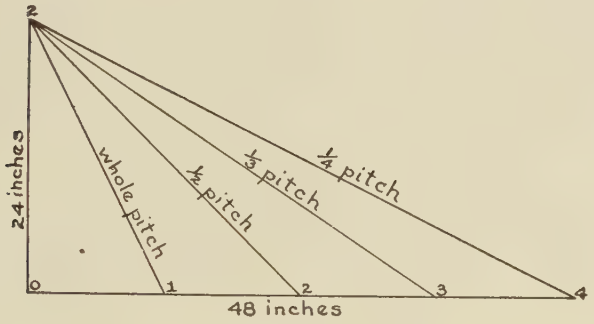


Fig. 27.

Fig. 27 shows how the pitch of a roof is determined. The slope 2 to 4 gives a $\frac{1}{4}$ pitch; the slope 2 to 3 gives a $\frac{1}{3}$ pitch; the slope 2 to 2 gives a $\frac{1}{2}$ pitch; and the slope 2 to 1 gives a whole pitch. In the illustration, the height of the ridgepole is 0 to 2, and as the span of the roof corresponds with the width of the building, 0 to 4 is $\frac{1}{2}$ the span of the roof. When the span is 4 times the height from the plate to the

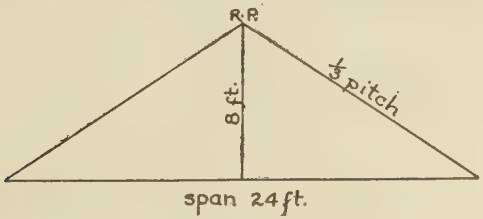


Fig. 28.

ridgepole, the pitch is $\frac{1}{4}$; when the span is 3 times the height from the plate to the ridgepole, the pitch is $\frac{1}{3}$, etc. In fig. 28 the span is 24 ft. and the height from the plate to the ridgepole is 8 ft. Therefore, the pitch is $\frac{8}{24}$ or $\frac{1}{3}$.

To find the length of the rafters in the illustration given, extract the square root of 8^2 plus 12^2, which is 14.42 ft. To allow for an overhang of 12″, the rafters would have to be cut 15.42 ft. long, or approximately 15 ft., 5 in. long.

Roofing material is usually estimated by the square foot or by the square yard, except in the case of shingles and shingle materials.

A bundle of shingles contains the equivalent of 250 shingles, 4 in. wide (common shingles vary in widths). Estimates have to be made in whole bundles, as parts of a bundle are, as a rule, not sold.

The unit of computation is the **square,** equal to 100 sq. ft.

To find the number of squares in a roof.—

To find the number of squares in a roof, divide the number of square feet in the surface of the roof by 100 (100 sq. ft. in a square).

The following scale can be used for estimating shingles:

1000	shingles	laid	4	in.	to	the	weather	will	lay	one square.
900	"	"	$4\frac{1}{2}$	"	"	"	"	"	"	"	"
800	"	"	5	"	"	"	"	"	"	"	"
700	"	"	$5\frac{1}{2}$	"	"	"	"	"	"	"	"
600	"	"	6	"	"	"	"	"	"	"	"

The foregoing table may be computed as follows:

To find the number of shingles required to lay a square (10′ × 10′), *multiply the number of square inches in a square foot by* 100, *and divide the result by the number of square inches in each shingle exposed to the weather.*

Example.—How many 4″ shingles, laid 6″ to the weather, will lay one square?

144 × 100 ÷ 4 × 6 (a 4″ shingle laid 6″ to the weather) = 600

Therefore, 600 shingles laid 6″ to the weather are required to lay one square. (100 sq. ft.)

When shingle material is of a uniform width, multiply the width in inches by the number of inches exposed to the weather. This will give the number by which 144×100 is to be divided to find the number of separate pieces or shingles required to lay one square.

To find the cost of shingles for a roof.—

Example.—Find the cost, at \$6.50 per M., of shingles laid 5″ to the weather, for a roof 20 ft. wide and 40 ft. long on each side.

$$\frac{40 \times 20 \times 2}{100} = 16, \text{ the number of squares to be covered}$$

$16 \times 800 = 12{,}800$, the number of shingles required

13,000 shingles must be purchased, as part of a bundle is not sold.

$13{,}000 \times \$6.50$ per M. = \$84.50, cost of the shingles

$40 \times 20 \times 2$ (2 sides) gives the number of square feet in the surface of the roof. This result, divided by 100 (100 sq. ft. in a square), gives the number of squares to be covered. This result, multiplied by 800 (800 shingles laid 5″ to the weather cover a square), gives the number of shingles required.[1]

Problems

1. How many shingles, laid $5\frac{1}{2}$″ to the weather, will be required to cover two sides of a roof 44 ft. long and 28 ft. wide on each side?

2. (a) How many shingles, laid $4\frac{1}{2}$ inches to the weather, will be required to cover a shed roof 18 ft. wide and 80 ft. long? (b) Find the cost of these shingles at \$7.50 per M.

3. Find the cost, at \$8.25 per M., of the shingles required to cover a roof 22 ft. wide and 48 ft. long on each side, if the shingles are laid 5 in. to the weather.

4. Find the cost, at \$1.50 per square yard, of the roofing material required to cover a roof 15 ft. wide and 38 ft. long on each side.

5. Find the cost, at \$2.40 per C., of the slates, 8″ wide and laid 6″ to the weather, which are required to cover a roof 26 ft. wide and 65 ft. long on each side.

[1] Allowance must be made for the first row of shingles, which is double, and for valleys and ridges.

Measurement of Wood

The unit commonly used for measuring split wood is the **cord.**

A cord of wood is 4 ft. wide, 4 ft. high, and 8 ft. long. It contains 128 cu. ft.

Wood is cut in sticks of various lengths, of which 12″, 16″, 18″ and 24″ are the most common.

To find the number of cords contained in a pile of wood.—

Example.—How many cords are there in a pile of wood 15 ft. long, 8 ft. wide, and 6 ft. high?

$$\frac{15 \times 8 \times 6}{128} = 5\tfrac{5}{8}, \text{ the no. of cords of wood in the pile}$$

$15 \times 8 \times 6 = 720$, the number of cu. ft. in the pile. Dividing 720 by 128 (the no. of cu. ft. in 1 cord) gives $5\frac{5}{8}$, the number of cords.

Problems

1. Find the cost, at $12 per cord, of a pile of wood 34 ft. long, 4 ft. wide, and 8 ft. high.

2. Find the cost, at $14.50 per cord, of a pile of wood 56 ft. long 4 ft. wide, and 7 ft. high.

3. Find how many cords of wood can be piled in a shed 18 ft. long, 12 ft. wide, and 10 ft. high.

4. A dealer sold, for $14.50 a cord, a pile of 4 ft. wood 80 ft. long and 5 ft. high, for which he had paid $75. It cost him $2.50 a cord to have the wood cut into 2 ft. lengths, and $1.50 a cord to deliver it. How much did he gain?

5. A workman started a pile of 4 ft. wood, 40 ft. long. How high will he have to pile it to make 10 cords?

Measurement of Masonry

In brick masonry, the common brick used measures $8'' \times 4'' \times 2''$. To estimate the number of bricks necessary for each cubic foot of masonry, one must allow $\frac{1}{4}''$ additional to each dimension of the brick for the mortar.

The number required for a cubic foot is calculated as follows:

$$1728 \div (8\tfrac{1}{4} \times 4\tfrac{1}{4} \times 2\tfrac{1}{4}) = \text{approximately 22 bricks}$$

1728 cu. in. (the number in a cu. ft.) divided by the number of cu. in. in a brick, after $\frac{1}{4}''$ has been added to each dimension as an allowance for the mortar, gives the number of bricks required for a cubic foot.

The number of bricks of any other than standard size required for a cubic foot of masonry can be found in the same way.

To find the number of bricks required to build a piece of masonry.—

Example.—How many bricks are required for a foundation wall 1 ft. thick, 5 ft. high, 40 ft. long on the two sides, and 20 ft. long on the two ends, outside measurements, and no allowance for openings. (In estimating the cost of laying bricks, allowances are not made for openings unless specified in the contract.)

40 ft. + 40 ft. + 20 ft. + 20 ft. = 120 ft., the perimeter of the wall.

120 ft. − 4 ft. (allowance for corners) = 116 ft. the net perimeter of the wall.

116 × 5 × 1 = 580, number of cu. ft. of masonry in the wall

580 × 22 (22 bricks per cu. ft.) = 12,760, the no. of bricks required

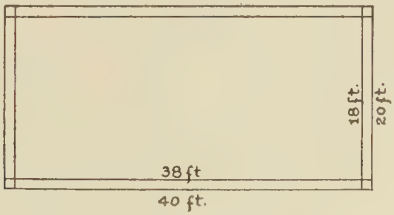


Fig. 29.

When outside measurements are given, the corners have to be deducted, else they would be counted twice. When inside measurements are given, the corners have to be added; otherwise they would not be counted at all. (See fig. 29.)

Problems

1. Find the cost of the brick, at \$14 per M, for a wall 60 ft. long, 7 ft. high, and 18 in. thick.

2. How many bricks are required for a cellar wall, 12 in. thick and 7 ft. high, the inside measurements of which are 36 ft. on each of the two sides and 24 ft. on each of the two ends? Allow for 6 windows 18″ × 30″. (Add the corners.)

3. Find the cost, at \$12 per M, of the bricks needed to build a wall 4 ft. high and 8 in. thick around the outside of a lot 150 ft. long and 75 ft. wide.

4. The excavation for a cellar is 42 ft. by 28 ft. (a) How many bricks will be required for a wall 12 in. thick and $7\frac{1}{2}$ ft. high, allowing 24 sq. ft. for openings? How much will the bricks cost, at \$12.50 per M?

Stone masonry is measured either by the cubic yard or by the **perch** ($24\frac{3}{4}$ cu. ft.), which is 1 rd. long, $1\frac{1}{2}$ ft. thick, and 1 ft. high. In practice, the perch varies from $16\frac{1}{2}$ to 25 cu. ft.[1]

In estimating the amount of stone required, allowance is made for corners and openings; but, in estimating the cost of laying the stone, no allowance is made because of the extra time required to lay stone around corners and openings.

To find the number of perch contained in a piece of masonry.—

Example.—Find the number of perch of masonry in the four walls of a foundation 2 ft. thick, 44 ft. by 32 ft., and 8 ft. high.

44 ft. + 44 ft. + 32 ft. + 32 ft. = 152 ft., perimeter outside of the foundation

152 ft. − 8 ft., (the four corners) = 144 ft., net length of the foundation

144 × 2 × 8 = 2304, number of cu. ft. in the foundation

2304 cu. ft. ÷ $24\frac{3}{4}$ cu. ft. = $93\frac{1}{11}$, number of perch

To find the number of cubic feet in stone work, multiply the length (the net length or the net perimeter) of the wall by the thickness and this result by the height. The number of cubic feet, divided by 27, will give the number of cubic yards; or, divided by $24\frac{3}{4}$, will give the number of perch.

[1] On account of the content of the perch being indefinite, the cubic foot and the cubic yard are generally used.

Problems

1. Find the number of perch of masonry in a wall 180 ft. long, 18 in. thick, and 5 ft. high.

2. Find the number of perch in a wall 1 ft. thick and 4 ft. high which encloses a yard 100 ft. square. (The outside wall line is the same as the yard line.)

3. How many cubic yards of masonry are there in a wall 15 in. thick and 6 ft. high, built around the outside of a court 40 ft. wide, and 120 ft. long? (Corners must be added.)

APPROXIMATE MEASUREMENTS

Capacities of Bins

In a bushel of grain there are 2150.42 cu. in. and, as there are 1728 cu. in. in a cubic foot, a cubic foot is equal to $\frac{1728}{2150.42}$ or .8+ bu.

To find, in bushels of grain, the capacity of a bin.—

Example.—Find the capacity in bushels of a bin 12 ft. long, 10 ft. wide, and 8 ft. deep.

12 ft. $\times$ 10 ft. $\times$ 8 ft. = 960, the number of cubic feet in capacity
960 $\times$ .8 = 768, the capacity in bushels

The number of bushels of grain a bin will hold is found by multiplying its capacity in cubic feet by .8.

Problems

1. A bin is 24 ft. long, 16 ft. wide, and 6 ft. deep. How many bushels of grain will it hold?

2. A bin is 16 ft. long, 12 ft. wide, and 8 ft. deep. How many bushels of wheat will it hold?

3. A bin 30 ft. long and 10 ft. wide, containing 2100 cu. ft., is filled with wheat. (a) How deep is the bin? (b) How many bushels does it contain?

4. The grain capacity of a 60,000-pound railway car is 1024 bu. If the car is 40 ft. long and 8 ft. wide, to what depth may it be filled?

The heaped bushel used in measuring fruits and vegetables contains 2747.71 cu. in.; therefore, a cubic foot of space contains $\frac{1728}{2747.71}$, or .63 bu.

To find the capacity of a bin in heaped bushels.—

Example.—How many bushels of potatoes can be put into a bin 28 ft. long, 12 ft. wide, and $4\frac{1}{2}$ ft. deep?

28 ft. × 12 ft. × $4\frac{1}{2}$ ft. = 1512, the number of cu. ft. in capacity
1512 × .63 = 952.56, or approximately 953 bu.

The capacity of a bin in cubic feet, multiplied by .63, *gives approximately the capacity in heaped bushels.*

Bear in mind, however, that when grain and vegetables are sold, the number of bushels is, as a rule, determined by weight.

Problems

1. A bin is 14 ft. long, 8 ft. wide and 4 ft. deep. How many bushels of turnips will it hold?

2. A wagon box is 12 ft. long, $3\frac{1}{2}$ ft. wide, and $2\frac{1}{2}$ ft. deep. How many bushels of potatoes will it hold?

3. How deep will a bin, 16 ft. long and 8 ft. wide, have to be to hold 400 bu. of potatoes? Find result in the nearest whole number of feet.

Measures of Hard Coal

A ton of hard stove coal occupies approximately $34\frac{1}{2}$ cu. ft. of space.

To find the number of tons of coal in a bin.—

Example.—How many tons of hard coal can be put into a bin 12 ft. long, 10 ft. wide, and 7 ft. deep?

12 ft. × 10 ft. × 7 ft. = 840, capacity of bin in cu. ft.
840 ÷ $34\frac{1}{2}$ = $24\frac{8}{23}$, number of tons in the bin

To find the number of tons of coal which a bin will hold, divide its capacity in cubic feet by $34\frac{1}{2}$.

Capacity of Cisterns, Tanks, and Reservoirs

The gallon contains 231 cu. in. Therefore, a cubic foot of space will contain $\frac{1}{2}\frac{7}{3}\frac{2}{1}\frac{8}{}$, or 7.48 gallons (approximately $7\frac{1}{2}$ gal.).

To find the number of gallons in a tank.—

Example.—Find the capacity in gallons of a storage tank 12 ft. long, 4 ft. wide, and 2 ft. deep, inside measurements.

12 ft. $\times$ 4 ft. $\times$ 2 ft. = 96, capacity of the tank in cu. ft.
96 $\times$ $7\frac{1}{2}$ = 720, the number of gallons, approximately

More exactly:

96 $\times$ 7.48 = 718.08 the number of gallons

Exactly:

96 $\times$ $\frac{1}{2}\frac{7}{3}\frac{2}{1}\frac{8}{}$ = 718 $\frac{3}{2}\frac{0}{3}\frac{}{1}$, the number of gallons

To find the approximate capacity of a tank or reservoir, multiply the capacity in cubic feet by $7\frac{1}{2}$; *or, to be more exact, by* 7.48. *To be absolutely exact, multiply the capacity in cubic feet by* $\frac{1}{2}\frac{7}{3}\frac{2}{1}\frac{8}{}$. (1728 *cu. in. in a cubic foot, and* 231 *cu. in. in a gallon.*)

Problems

1. Find approximately the capacity in gallons of a tank 16 ft. long, 5 ft. wide, and 3 ft. deep.

2. Find approximately the capacity of a reservoir 200 ft. long, 80 ft. wide, and 8 ft. deep.

3. How many cubic feet approximately is the capacity of a tank which will hold 9000 gallons?

Example.—Find approximately the capacity in gallons of a cistern 6 ft. in diameter and 6 ft. deep.

6 $\times$ 6 $\times$ .7854 $\times$ 6 $\times$ $7\frac{1}{2}$ = 1272.384, the number of gallons approximately

Or,

6 $\times$ 6 $\times$ .7854 $\times$ 6 $\times$ 7.48 = 1268.95, the number of gallons

But,

7.48 $\times$ .7854 = about $5\frac{7}{8}$

Therefore, the process can be shortened by multiplying the square of the diameter by the depth, and the result by $5\frac{7}{8}$.

6 $\times$ 6 $\times$ 6 $\times$ $5\frac{7}{8}$ = 1269, approximately the number of gallons.

Problems

1. Find approximately the number of gallons in the capacity of a tank 9 ft. in diameter and 12 ft. deep.

2. Find approximately the capacity in barrels of a cistern 12 ft. in diameter and 7 ft. deep. ($31\frac{1}{2}$ gal. in a barrel.)

3. An oil tank is 12 ft. long and 4 ft. in diameter. How many gallons approximately will it hold?

4. A storage tank filled with water is 6 ft. in diameter and holds 2544.-6960 gallons. How deep is it?

5. Water weighs $62\frac{1}{2}$ lb. per cubic foot. What would be the weight of the water in the tank in the preceding problem?

GOVERNMENT LAND SURVEYS

The unit of land measurement is the **acre,** which contains 160 sq. rd.

A **section** of land contains 640 acres and is 1 mi. square.

A **township** contains 36 sections of land and is 6 mi. square.

In surveying government lands, a north and south line is selected as a **principal meridian,** and an east and west line as a **base line.**

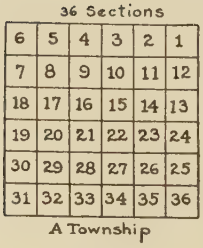


Fig. 30a.

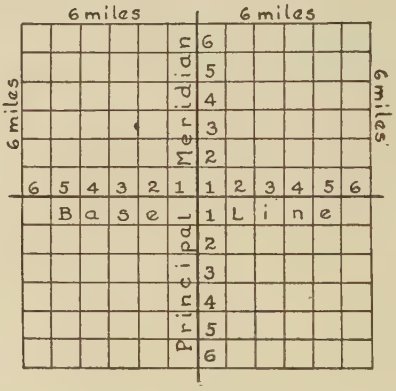


Fig. 30b.

The meridian lines run parallel to each other, and the base lines also run parallel, six miles apart, and divide the land into townships as shown in the illustration. (Fig. 30b shows four townships).

Sections can be divided into halves (320 A.), quarters (160 A.), etc. The S. E. $\frac{1}{4}$ of the N. E. $\frac{1}{4}$ of section 32 contains 40 A. (See fig. 31.)

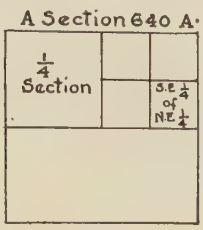


Fig. 31.

To find the square measurements of a tract of surveyed land.—

Example.—The E. $\frac{1}{2}$ of the S. E. $\frac{1}{4}$ of section 32 was sold for \$140 per acre. (a) How many acres were sold? (b) For how much were they sold?

The S. E. $\frac{1}{4}$ of the E. $\frac{1}{2}$ of section 32 is 80 A.
80A. $\times$ \$140 = \$11,200, the amount

Problems

1. For how much was the S. W. $\frac{1}{4}$ of the S. $\frac{1}{2}$ of Section 28 sold, at \$85 per acre?

2. A real estate agent sold the following tracts of land: (a) the N. W. $\frac{1}{4}$ of the N. W. $\frac{1}{4}$ of section 21, at \$90 per acre; (b) the S. $\frac{1}{2}$ of S. E. $\frac{1}{4}$ of section 19, at \$110 per acre; (c) the N. E. $\frac{1}{4}$ of section 12, at \$85 per acre. How much did he receive for each tract?

3. A farmer desires to fence the West $\frac{1}{2}$ of the N. W. $\frac{1}{4}$ of section 24. How much will it cost him at \$1.20 per rod?

4. Find the cost, at \$2.50 per acre, of plowing the E. $\frac{1}{2}$ of the S. E. $\frac{1}{4}$ of section 28.

SPECIFIC GRAVITY

The **specific gravity** of a substance is the ratio of its weight to the weight of an equal volume of water. (1 cu. ft. of water weighs $62\frac{1}{2}$ lb.)

To find the specific gravity of a substance.—

Example.—Find the specific gravity of a cubic foot of dry mahogany wood which weighs 41 lb.

$$41 \div 62\tfrac{1}{2} = \frac{41}{62\frac{1}{2}} = \frac{82}{125} = .656, \text{ the specific gravity}$$

Any object which floats in water will displace an amount of the water equal in weight to the weight of the object.

Any object that sinks in water will displace a volume of the water equal to its own volume.

Weights of Various Substances

SOLIDS

Material	*Lbs. per Cu. Ft.*	*Material*	*Lbs. per Cu. Ft.*
Celluloid	87	Leather, dry	54
Charcoal, Oak	35	Peat	52
Ebonite	72	Pitch	67
Emery	250	Rock Salt	136
Flint	164	Starch	95
Gelatin	180	Sugar	100

WOODS

Wood	*Lbs. per Cu. Ft.*	*Wood*	*Lbs. per Cu. Ft.*
Butternut	25	Logwood	57
Cork	15	Mahogany	41
Dogwood	47	Spruce	30–44

Specific Gravities of Various Substances

Brick	2.000	Milk	1.032
Butter	.942	Oak	.40
Copper	8.788	Salt	2.130
Gold, pure	19.258	Sand	2.650
Granite	2.704	Steel, cast	7.919
Ice	.92	Sugar	1.600
Lard	.947	White Pine, dry	.40

Examples.—1. Find the specific gravity of a cubic foot of celluloid.

$87 \div 62\frac{1}{2} = 1.392$, the specific gravity

2. Find the weight of a cubic foot of butter.

$62\frac{1}{2} \times .942 = 58.875$ = lb. per cu. ft.

3. Find the specific gravity of a substance that floats with $\frac{4}{5}$ of its volume in the water.

$62\frac{1}{2} \times \frac{4}{5} = 50$, the specific gravity

Problems

1. Find the specific gravity of each of the following: (See the preceding tables on "Weights of Various Substances").

(a) Emery
(b) Flint
(c) Peat
(d) Rock Salt
(e) Butternut wood
(f) Dogwood

2. Find the weight of a cubic foot of each of the following: (See the preceding table on "Specific Gravities of Various Substances").

(a) Copper (c) Milk (e) Sand
(b) Granite (d) Salt (f) Sugar

3. Find the weight of a piece of ice 3 ft. long, 2 ft. wide, and 1 ft. thick.

4. Find the weight of a cubic foot of pure gold.

5. Find the specific gravity of a substance that floats with $\frac{3}{5}$ of its volume in the water.

6. Find the specific gravity of a substance that floats with $\frac{3}{4}$ of its volume in the water.

Review Problems

1. A dealer bought 800 lb. of butter for \$328 and sold it for 48¢ a pound, and 920 lb. for \$395.60 and sold it for 51¢ a pound. (a) How much per pound did he pay for each lot of butter? (b) How much did he gain?

2. A man traded 750 acres of woodland, worth \$25 per acre, for a farm of 125 acres. How much per acre did the farm cost him?

3. A man sold $\frac{5}{8}$ of all the wheat he raised at the rate of \$1.40 per bushel, and received for it \$2800. How many bushels did he raise?

4. A lot and the house on it are worth \$16,400. The house is worth 3 times as much as the lot. How much is each worth?

5. *A* invested \$4500 in a business and *B* invested \$4000. The profits for the year were \$3400. In proportion to his investment, how much should each partner receive?

6. A dealer bought a quantity of lard for \$43.75. By selling it a $17\frac{1}{2}$¢ a pound, he gained $\frac{2}{5}$ of its cost. How many pounds did he buy?

7. After selling $\frac{5}{8}$ of the wheat in a bin, a farmer had 1500 bushels left. (a) How many bushels were in the bin? (b) How many bushels were sold? (c) How much was the entire quantity worth at \$1.37$\frac{1}{2}$ ¢ a bushel?

8. In a certain city of 84,560 inhabitants the tax budget was \$1,960,480. Find, to the nearest tenth of a mill, the cost per inhabitant of running the city.

9. How much is gained by buying 380 long tons of coal at \$12.80 a long ton, and selling it at \$14.75 a short ton?

10. A roadway is 4356 feet long. What decimal part of a mile is the length of this roadway?

11. (a) How many acres are there in a field 320 rd. long and 140 rd. wide? (b) How many rods long is a fence running around this field?

12. Find the cost, at 48¢ per square foot, of building a 4 ft. sidewalk on two sides of a corner lot 100 ft. by 50 ft. The lot line is the inside line of the walk.

13. Find the cost, at 45¢ per square yard, of painting the walls and ceiling of a room 18 ft. long, 14 ft. wide, and $8\frac{1}{2}$ ft. high, allowing for 2 windows, 3 ft. by 5 ft., and 1 door, 3 ft. by 7 ft.

14. The sides of a lot, in the shape of a triangle, measure 120 ft., 100 ft., and 80 ft., respectively. How many square yards are there in the area?

15. Find the number of square rods in a trapezoid, of which the parallel sides measure 100 ft. and 80 ft., respectively, and the distance between the sides is 60 ft.

16. Find the volume of a solid block of stone 3 ft. long, 2 ft. wide, and $1\frac{1}{2}$ ft. thick.

17. What will it cost, at 30¢ per square yard, to paint, the outside (sides and bottom) of a tank 6 ft. in diameter and 8 ft. high?

18. A water tank has a diameter of 8 ft. and is 12 ft. deep. Approximately how many gallons will it hold?

19. At 45¢ per square yard, how much will it cost to paint the two gable ends of a barn, which are 45 ft. wide and measure 15 ft. from plate to ridgepole?

20. How many cords of wood are there in a pile 40 ft. long, 4 ft. wide and 6 ft. high?

21. Find the cost, at 85¢ per square yard, of plastering the walls and ceiling of a room 20 ft. long, 15 ft. wide, and 9 ft. high, allowing 60 sq. ft. for openings.

22. How many common bricks will be required to lay a wall 40 ft. long, $1\frac{1}{2}$ ft. thick, and 3 ft. high?

23. Find the area of a circular park having a diameter of 80 rods.

24. Find the hypotenuse and the area of a right-angled triangle whose base is 20 ft. and whose altitude is 15 ft.

25. At $48 per M., find the cost of 60 pieces of lumber 2 in. by 6 in. and 12 ft. long.

PERCENTAGE

Percentage means "by hundredths" and includes the processes of computing by hundredths.

Per cent is another name for hundredths. 8 per cent, .08, and $\frac{8}{100}$, all have the same value.

The symbol, or sign, for per cent is %. Thus, 4% means .04, or $\frac{4}{100}$.

Any per cent can be expressed as a decimal or as a common fraction. For instance, "seven hundredths" may be written equally well as a per cent, 7%; as a decimal, .07; or as a fraction,

$\frac{7}{100}$. Fractional equivalents may also be used: as, for instance, in the case of 8%—$\frac{8}{100}$, or $\frac{4}{50}$, or $\frac{2}{25}$.

The **base** is the number on which the per cent is computed. Thus, in finding 4% of \$100, 100 is the base.

The **rate** is the per cent to be taken. In finding 4% of \$100, 4 is the rate.

The **percentage** is the result obtained by taking as many hundredths of the base as the rate per cent shows. In finding 4% of \$100, the percentage is \$4.

To find the percentage when the base and rate are given.—

Example.—Find 14% of \$1280.

100% = \$1280, the base
1% = \$12.80 (point off two places for 1%)
14% = 14 × \$12.80 = \$179.20, the percentage

Or,

14% means .14
\$1280 × .14 = \$179.20, the percentage

Hence, *rate times base equals the percentage.*

Always place to the right of the equality sign whatever unit is called for in the answer, as, for example, per cent, dollars, pounds, bushels, and the like.

Problems

1. Find 28% of \$1560.

2. A man owned 840 acres of land. He sold 33⅓% of what he owned. How many acres did he sell?

3. The registration in a certain school was 750 pupils. On a stormy day 6% of the pupils were absent. (a) How many pupils were absent? (b) How many were present?

4. A man had \$28,000 in cash. He invested 12½% of his money in U. P. R. R. stock, and 52% in Traders Bank stock. (a) How much did he invest in each kind of stock? (b) How much money had he left?

5. A dealer bought 8000 bu. of potatoes at \$1.12 per bushel. He sold 65% at one time at \$1.30 per bushel; 30% at another time at \$1.15 per bushel; and the remainder at \$1 per bushel. How much did he gain?

To find the base when the percentage and the rate are given.—

Example.—\$179.20 is 14% of what number of dollars?

14% = \$179.20 (dollars called for in the answer)
1% = $\frac{1}{14}$ × \$179.20 = \$12.80
100% = 100 × \$12.80 = \$1280, the base

Or,

\$179.20 ÷ .14 (14% = .14) = \$1280, the base

Hence, *the percentage divided by the rate equals the base.*

Problems

1. A farmer sold 380 bbl. of apples, which was 40% of his entire crop. How many barrels were there in the crop?

2. A party on a motor trip traveled 180 miles the first day. This was 15% of the total distance traveled. How far did they travel?

3. A merchant's profit for one year was \$3750, which was $12\frac{1}{2}$% of the amount he had invested in the business. How much did he have invested?

4. In a drive to raise funds for a hospital, \$138,000 was raised, which was 92% of the amount needed. How much was needed?

5. In a certain school, the average attendance for one month was 511.52. The percentage of attendance was 92. How many pupils were on register?

To find the rate when the percentage and base are given.—

Example.—\$179.20 is what per cent of \$1280?

\$1280 = 100% (per cent called for in the answer)
\$ 1 = $\frac{100}{1280}$%, the value of \$1 expressed in per cent
\$179.20 = 179.20 × $\frac{100}{1280}$% = 14% of \$1280

Or,

\$179.20 ÷ \$1280 = .14, or 14%

Hence, *the percentage divided by the base equals the rate.*

Problems

1. An investor received \$360 dividend on an investment of \$8000 What rate per cent did the investment pay?

2. A young lady earns \$1200 a year, and she pays \$546 a year for board. What per cent of her wages does she pay for board?

3. A merchant's assets amount to $34,200 and his liabilities are $2565. What per cent of his assets are his liabilities?

4. There were 1050 pupils registered in a certain school and of this number, 42 were absent on Monday. What per cent were absent?

5. A man's salary was $3600 a year. He paid $900 a year for rent. What per cent of his salary was his rent?

Miscellaneous Problems in Percentage

Example.—A man's income this year is 20% more than his income last year. If his income this year is $5280, what was his income last year?

In this problem, the rate per cent of increase and the amount are given. The problem is to find the base.

$$100\% = \text{the base (the income last year)}$$
$$100\% + 20\% = 120\% = \text{per cent of income this year}$$
$$120\% = \$5280, \text{ amount of income this year}$$
$$1\% = \tfrac{1}{120} \times \$5280 = \$44$$
$$100\% = 100 \times \$44 = \$4400, \text{ the base (income last year)}$$

Or,

$$\$5280 \div 1.20\ (120\%) = \$4400, \text{ the base}$$

Problems

1. A farmer sold 15% more apples in 1928 than he did in 1927. If he sold 667 bbl. in 1928, how many barrels did he sell in 1927?

2. A building lot is assessed at $1375, which is 10% more than it was assessed at last year. What was its assessed valuation last year?

3. A merchant's sales for 1928 amounted to $142,130, an increase of 22% over his sales for 1927. How much were his sales for 1927?

Example.—A manufacturing plant produced 84,600 articles of a certain kind this year, which was $12\frac{1}{2}\%$ less than was produced the year before. How many were produced the year before?

In this problem the rate per cent of decrease and the difference are given. The problem is to find the base.

$100\% = \text{the base (number of articles produced last year)}$

$100\% - 12\frac{1}{2}\% = 87\frac{1}{2}\% = \text{number of articles produced this year}$

$87\frac{1}{2}\% = 84{,}600$

$$1\% = \frac{1}{87\frac{1}{2}} \times 84{,}600 = 952.75$$

$100\% = 100 \times 952.75 = 95{,}275$, the base (number of articles produced last year

Or,

$$84{,}600 \div .87\tfrac{1}{2}(100\% - 12\tfrac{1}{2}\%) = 95{,}275, \text{ the base}$$

Problems

1. A man sold a house and lot for \$9500, which was 5% less than he paid for them. What was the purchase price?

2. By selling an old model automobile for \$925, the dealer lost $7\frac{1}{2}\%$ of the first cost of the car and \$42 freight. How much did the car cost the dealer?

3. Out of his entire crop, a grower was able to market only 2800 boxes of oranges, 20% of his crop having been damaged by a storm. How many boxes should he have marketed?

4. In mining and handling coal, 4% is wasted. How many tons of 2000 lb. each would have to be mined to load 40 cars with 30 tons each?

5. A merchant received \$1470 for goods damaged by fire. This amount was 40% less than the cost of the goods. How much did the goods cost him?

Aliquot Parts Applied to Percentage

The principle and method used in solving problems in which aliquot parts are used may be applied to percentage problems where the rate per cent is an aliquot part.

Example.—Find $12\frac{1}{2}\%$ of \$2400.

$12\frac{1}{2}\%$ is equal to $\frac{1}{8}$

$\frac{1}{8}$ of \$2400 = \$300, the result

Problems

1. $33\frac{1}{3}\%$ of \$900.

2. $66\frac{2}{3}\%$ of \$3600.

3. $6\frac{1}{4}\%$ of \$3200.

4. $14\frac{2}{7}\%$ of \$2800.

5. 25% of \$1200.

6. 50% of \$1870.

7. \$56 is $7\frac{1}{7}\%$ of what number of dollars?

8. \$75 is $33\frac{1}{3}\%$ of what number of dollars?

9. \$84 is $16\frac{2}{3}\%$ of what number of dollars?

10. $8\frac{1}{3}\%$ of what number of dollars will equal \$300?

General Problems

1. A man who received a salary of $300 a month, used 65% of it to pay his living expenses. How much did he save in 12 months?

2. A debtor settled with a creditor by paying him $840, which was 80% of the amount owed. How much did the creditor lose?

3. During a season a salesman traveled 54,600 miles. He traveled $66\frac{2}{3}\%$ of this distance on trains and the rest by automobile. How far did he travel (a) on trains? (b) By automobile?

4. A man had $5400 on deposit in a savings bank. At one time he withdrew 35%, and at another time he withdrew 15% of what remained. (a) How much did he withdraw each time? (b) How much remained in the bank?

5. A man bought an automobile for $1800. He kept it a year and then sold it for $1200. What per cent of the cost was the depreciation during the first year?

6. J. D. Evans bought a store building and the lot on which it stood for $45,000, and sold them for $42,000. What per cent of the cost did he lose?

7. A dealer sold a chair for $46.90, at a gain of 40%. How much did the chair cost him?

8. How much did a dealer lose by selling a used automobile for $700, at a loss of $12\frac{1}{2}\%$?

9. A dealer sold some damaged goods at a loss of $33\frac{1}{3}\%$, thereby losing $200. (a) How much did the goods cost? (b) For how much were they sold?

10. A merchant sold an article for $25.50, at a loss of 15%. (a) How much did the article cost him? (b) How much did he lose?

11. A depositor gave a check for $124. The amount of this check was 8% of the amount he had in the bank. How much did he have in the bank?

12. A county with a population of 236,740 has increased 40% in 10 years. What was its population 10 years ago?

CREDITS

Credits are established through **charge accounts.** The customer is charged on the books of the seller, or creditor, with a certain amount, according to goods purchased or services rendered. **Bills,** or **statements,** are rendered at different times for these accounts, and when they are paid, the customer receives credit for the account settled. When all charges have been paid, his account is settled, or **balanced.**

It is in this connection that cash and trade discounts play an important part.

E. W. Henderson (Customer)
128 State Street, Chicago, Ill.

1929			F		1929			F	
Jan.	2	Mdse. 2/10, n/60	7	1420	Jan.	9	Cash 2/10	24	1420
Jan.	24	Mdse. 2/10, n/60	9	1150	Feb.	2	Cash 2/10	32	1150
Feb.	15	Mdse. 2/10, n/60	12	740					
Mar.	12	Mdse. 2/10, n/60	15	570					

Mr. Henderson's account shows a balance of $1310.

TRADE DISCOUNTS

Trade discounts are deductions, according to the terms of the sale, from the list price of goods sold.

List price is the price at which the goods are listed, before the discounts are deducted.

Net cost is the cost of the goods after the discounts are deducted.

To find the net cost when the list price and discounts are given.—

Example.—Find the net cost of goods invoiced at $1263.80, less $12\frac{1}{2}\%$ and 2%.

$1263.80 = list price of the goods
$12\frac{1}{2}\% = .12\frac{1}{2} \times \$1263.60 = \$157.95$, discount at $12\frac{1}{2}\%$
$\$1263.60 - \$157.95 = \$1105.65$, net cost after $12\frac{1}{2}\%$ discount is deducted
$2\% = .02 \times \$1105.65 = \$22.11$, discount at 2%
$\$1105.65 - \$22.11 = \$1083.54$, net cost of goods

Where there are two or more discounts, deduct one discount at a time. Figure the next discount on the remainder after the first discount has been deducted. It makes no difference in which order the discounts are deducted.

Problems

1. A merchant bought an invoice of goods amounting to \$1680, less $33\frac{1}{3}\%$ and 3%. Find the net cost.

2. Find the net cost of goods invoiced at \$2878.60, less 25% and 5%.

3. The terms on an invoice of goods amounting to \$1848.60 are: $16\frac{2}{3}\%$ and 2/10 n/30. Find the net cost if the goods are paid for within 10 days.

4. A dealer bought 2 doz. lamps at \$72 a dozen, less $33\frac{1}{3}\%$ and 5%. How much apiece did he pay for the lamps?

5. A dealer bought an invoice of automobile supplies amounting to \$2260, less 8% and 2%. Find the net cost.

To find a single discount equal to a series of discounts.—

First method:

Example.—Find a single discount equal to 40% and 5%.

$40\% + 5\% = 45\%$, the sum
$40 \times 5 = 200$, the product
$200 \div 100 = 2$, the quotient
$45\% - 2\% = 43\%$, the single discount

To find a single discount equal to two discounts, add the two discounts and from their sum subtract $\frac{1}{100}$ of their product.

Where there are three or more discounts, take the result of the first two with the third, and continue in like manner with the fourth.

Example.—Find a single discount equal to 30%, 10%, and 5%.

$30\% + 10\% = 40\%$, the sum
$30 \times 10 = 300$, the product
$300 \div 100 = 3$, the quotient
$40\% - 3\% = 37\%$, the single discount equal to 30% and 10%
$37\% + 5\% = 42\%$, the sum
$37 \times 5 = 185$, the product
$185 \div 100 = 1.85$, the quotient
$42\% - 1.85\% = 40.15\%$, the single discount equal to 30%, 10%, and 5%

Most of the computations can be made mentally, thereby shortening the process.

Other methods of finding a single discount are illustrated below:—

Example.—Find a single discount equal to 25% and 10%.

100% − 25% = 75%
10% of 75% = 7.5%
75% − 7.5% = 67.5%
100 − 67.5% = 32.5%, the single discount

Or,

100% − 25% = 75%
100% − 10% = 90%
.75 × .90 = .675 = 67.5%
100% − 67.5% = 32.5%, the single discount

The first method is preferred because it lends itself more readily to mental calculations.

Problems

Find single discounts equal to the following series:

1. 40% and 5%
2. 35% and 10%
3. 15% and 5%
4. 75% and 5%
5. 50% and 25%
6. 20%, 5%, and 2%
7. 40%, 20%, and 5%
8. 50%, 20%, and 2%
9. 60%, 10%, and 3%
10. 25%, 20%, and 4%

To find the list price when the net cost and discounts are given.—

Example.—The net cost of an invoice of goods was $1199.52 after 10% and 2% discount had been deducted. What was the list cost?

10% and 2% = 11.8%
100% − 11.8% = 88.2% = the net cost
1199.52 ÷ .882, or 88.2% = $1360, the list price

Or,

100% − 10% = 90%
100% − 2% = 98%
.98 × .90 = .882 = 88.2% = the net cost
$1199.52 ÷ .882 = $1360, the list price

Problems

1. A merchant paid \$2428.20 for an invoice of goods after 10% and 5% had been deducted. What was the amount of the invoice?

2. Find the amount of an invoice of goods, the net amount of which was \$1208.62, after discounts of 30% and 3% were deducted?

3. The discounts on an invoice of goods were 40% and $12\frac{1}{2}$%. If the net cost was \$504.42, at what price were the goods invoiced?

4. A dealer paid \$911.40 cash for an invoice of goods on which he was allowed discounts of 25%, and 2% for cash. What was the amount of the invoice?

To find the net cost when the rates and amount of discount are given.—

Example.—The discounts on an invoice of goods were $33\frac{1}{3}$% and 3%, and the amount of discount was \$441.18. What was the net cost of the goods?

$33\frac{1}{3}$% and 3% = $35\frac{1}{3}$%
$35\frac{1}{3}$% = \$ 441.18, the discount
\$ 441.18 ÷ .$35\frac{1}{3}$ = \$1248.62, the list price
\$1248.62 − \$441.18 = \$ 807.54, the net cost

Problems

1. The discounts on an invoice of goods were 20% and 3%, and the amount of discount was \$349.44. What was the list cost of the goods?

2. The discount on an invoice of goods was 8%, and it amounted to \$144.80. What was the net cost of the goods?

3. The discounts on an invoice of goods were 8% and 3%. If the discount amounted to \$276.54, what was the net cost of the goods?

4. The discount on an invoice of goods was \$275.50, and the terms were $12\frac{1}{2}$% discount in 10 days, or 4 mo. credit. If cash was paid in 10 days, what was the net cost of the goods?

To find the amount of discount when the list price and rates of discount are given.—

Example.—A merchant bought an invoice of goods amounting to \$3412.25, terms 4/10, n/60. How much would

he make by borrowing the money at the bank at 6% for 60 days and paying cash for the goods?

$3412.25 × .04	= $ 136.49, the discount
$3412.25 − $136.49	= $3275.76, the net cost
$3275.76 at 6% for 60 da.	= $ 32.76, the interest
$ 136.49 − $32.76	= $ 103.73, amount gained

Problems

1. A merchant bought an invoice of goods amounting to $2360.50, terms 6/10, n/90. He borrowed the money at 6% for 90 days and paid cash for the goods. How much did he gain?

2. A dealer bought a consignment of pianos invoiced at $5890, less 15% trade discount and 5/10, n/4 mo. He borrowed the money at 6% for 4 mo. and paid cash. How much did he gain?

3. A clothing merchant bought an invoice of clothing amounting to $9360.50, terms 8% trade discount and 3/10, n/90. He borrowed the money for 90 days, at 6 % and paid cash. How much did he gain?

General Problems

1. A dealer bought goods at 20% and 5% discount, and sold them at the list price, less 4% discount. How much did he make on goods listed at $1500?

2. Which is the better discount for the purchases and how much better: (a) 30%, 10%, and 5%; or (b) a straight discount of 40%?

3. (a) One dealer offers an article for $18, less $33\frac{1}{3}$% and 10%. (b) Another dealer offers the same article for $15, less 25% and 5%. Which is the better offer, and how much better?

4. A merchant marked a chair $35, but during a sale he sold it for $28. What per cent did he discount the marked price?

5. The total discount on an invoice of goods was $171.60, and the discounts were $12\frac{1}{2}$% and 8%. Find the net cost of the goods.

PROFIT AND LOSS

Profit and **loss** are terms used to express the results of business transactions.

Goods are sold at a profit when sold for more than their cost, and at a loss when sold for less than their cost.

Prime, or net cost is the actual cost of goods purchased after all deductions have been made.

Gross cost is the cost after adding all charges such as freight, cartage, storage, and insurance.

Gross sales is the total of sales over a period of time at invoice prices.

Net sales is the amount of sales after all returns and allowances have been deducted.

Gross purchases is the total amount of goods bought for trading purposes.

Return purchases is the total of goods which, for some reason, are sent back to firms from which they were purchased.

Net purchases is the result after return purchases have been deducted from the gross purchases.

Gross profit is the result after the gross cost of goods sold has been deducted from the net sales.

Net profit is the result after the total selling expense has been deducted from the gross profit.

Profits and losses are computed on the gross cost or on the net sales.

The cost of doing business includes such items as rent, salaries, advertising, taxes, light and heat, and depreciation, but does not include items such as freight inward, cartage, buying commissions, etc., which make up the gross cost of merchandise.

Depreciation is the decrease in the value of property resulting from use, or from changes resulting in disuse.

To find the selling price when the net cost or the gross cost and the percentage of profit are given.—

Examples.—

1. A merchant bought an article invoiced at \$28.50, less 4% discount, and sold it at a profit of $33\frac{1}{3}\%$. What was the selling price?

$$4\% = .04 \times \$28.50 = \$1.14, \text{ the discount}$$
$$\$28.50 - \$1.14 = \$27.36, \text{ the net cost}$$
$$33\tfrac{1}{3}\% = .33\tfrac{1}{3} \times \$27.36 = \$9.12, \text{ the profit}$$
$$\$27.36 + \$9.12 = \$36.48, \text{ the selling price}$$

2. A dealer bought a piano for $312.50 net. He paid $17.50 freight and cartage, and sold the piano at a profit of 37½%. What was the selling price?

$312.50 + $17.50 = $330, the gross cost
37½% = .37½ × $330 = $123.75, the profit
$330 + $123.75 = $453.75, the selling price

Problems

1. A merchant bought an article invoiced at $12.50, less 4% discount, and sold it at a profit of 33⅓%. What was the selling price?

2. A machine was bought for $375, less 10% and 2% discount. The freight and cartage were $19.25. If the machine was sold at a profit of 40% on the gross cost, at what price was it sold?

3. A merchant bought 125 bbl. of potatoes at $4 a barrel. Five barrels decayed. At what price per barrel must he sell the good potatoes, to gain 20% on the whole cost?

4. A real estate dealer paid $2200 for each of two building lots. He sold one lot at a gain of 15%, and the other increased in value 25% the first year and 20% the second year, over and above its valuation the first year. (a) How much did he make on the lot he sold? (b) What was the valuation of the second lot at the end of the second year?

5. A man invested $4500 in a business. During the first year he lost 16⅔% of the amount he had invested, and during the second year he lost 18% of the amount he had remaining. How much had he left?

Example.—A merchant paid $9.80 for an article. He sold the article at a profit of 30% of the selling price. What was the selling price?

100% = the selling price
100% − 30% = 70% or .70, the cost
$9.80 ÷ .70 = $14, the selling price

Problems

1. An easy chair cost $30. It was sold at a profit of 33⅓% of the selling price. Find the selling price.

2. A dealer paid $16 a dozen for lamps, less 10% discount. For how much each must he sell the lamps to make a profit of 40% on the selling price?

3. A retailer paid $27.75 for an article. For how much must he sell it to gain 25% of the selling price?

4. A merchant paid cash for an article invoiced at $200, less 10% discount. For how much must he sell it to gain 33⅓% of the selling price?

To find the relation, expressed in a percentage, of selling expenses to gross sales.—

Example.—A merchant's gross sales were \$168,500 in one year, and in the same time his selling expenses were \$31,172.50. What per cent of his gross sales were his selling expenses?

\$31,172.50 ÷ \$168,500 = .18½, or 18½%, the cost of doing business

To find the net profit when the gross cost, the percentage of profit, and the selling expenses are given.—

Example.—The gross cost of an article is \$3.75. The article is sold at a profit of 25% on the selling price. How much is the net profit, if 18½% is charged to the cost of doing business.

100% − 25% = 75% or .75
\$3.75 ÷ .75 = \$5, the selling price
25% − 18½% = 6½%, per cent of net profit
6½% = .06½ × \$5 = \$.32½, amount of net profit

Problems

1. Goods invoiced at \$742, gross cost, will have to be sold for how much to allow 18½% for the cost of selling, and make a net profit of 11½% on the selling price?

2. If the gross cost of an article is \$17.38, for how much must it be sold to make 14¼%, the cost of selling, and make a net profit of 6¾%, all on the selling price?

3. A merchant's sales for the year were \$48,600. The cost of doing business was \$8100. An article that cost \$9 gross will have to be sold at what price to cover cost of doing business and realize a net profit of 8⅓% of the selling price?

4. A merchant's profit and loss statement at the end of the year shows the following selling expenses: salaries, \$18,000; advertising, \$4800; rent, \$6000; supplies, \$740; insurance, \$260; bad debts, \$2706.38. Find his per cent of cost of doing business, if his gross sales for the year amounted to \$212,460.

5. The expenses for buying goods invoiced at \$2500 were 3½% of the invoice price. For how much will these goods have to be sold to make a profit of 33⅓% of (a) the cost price, (b) the selling price? (Invoice price plus buying expenses equal cost price, or gross cost.)

To find the selling price when the net cost, the percentage of profit, and the cost of selling are given.—

Example.—An article that cost \$4.80 must be sold at what price to make a net profit of $12\frac{1}{2}\%$ of the cost, and allow 15% of the selling price for the cost of doing business?

$12\frac{1}{2}\%$ of \$4.80 = \$.60, the net profit
\$4.80 + \$.60 = \$5.40, the cost plus the net profit
100% − 15% = 85% = cost plus the net profit, or \$5.40
\$5.40 ÷ .85 = \$6.3529+ or \$6.35, the selling price

Problems

1. The invoice price of an article was \$16.75. The cost of buying was 4%. The profit on the gross cost was $8\frac{1}{2}\%$. The cost of doing business was 16% of the sales. Find (a) the selling price, (b) the net profit.

2. The invoice price of an article was \$9.60, less $16\frac{2}{3}\%$. The buying expenses were 5% of the net cost. What must be the selling price to make a profit of $12\frac{1}{2}\%$ on the gross cost, and allow 10% of the selling price to cover the cost of doing business?

To find the relation, in a percentage, of net profit to selling price.—

Example.—A furniture dealer bought a chair for \$15, less $33\frac{1}{3}\%$ and 4%. He sold it for \$20, less 20%. What per cent of the selling price was his net profit, if the cost of doing business was $27\frac{1}{2}\%$ of the sales?

\$15 less $33\frac{1}{3}\%$ less 4% = \$ 9.60, the gross cost
\$20 less 20% = \$16, the selling price
\$16 − \$9.60 = \$ 6.40, the gross profit
\$6.40 ÷ \$16 = .40, or 40%, per cent of gross profit on sales
40% − $27\frac{1}{2}\%$ (cost of doing business) = $12\frac{1}{2}\%$, per cent of net profit on sales

Problems

1. A dealer bought a stove for \$128, less $12\frac{1}{2}\%$ discount. He sold the stove for \$180, less 10% discount. What per cent of the net selling price was his net profit, if the cost of doing business was 18.36% of the sales?

2. A merchant bought an article for \$24, less $16\frac{2}{3}\%$ discount. He sold it for \$40, less 25% discount. What per cent of the net selling price was his net profit, if the cost of doing business was $23\frac{1}{3}\%$ of the sales?

3. A couch was bought for \$72, less $12\frac{1}{2}\%$. It was sold for \$100, less 10%. What per cent of the net selling price was the net profit, if the cost of doing business was $22\frac{1}{2}\%$ of the sales?

To find the relation, in a percentage, of net profit to gross cost or to net cost.—

Example.—Sweaters cost \$66 a dozen, less $33\frac{1}{3}\%$ and 5%. If the sweaters are sold for \$6 each, less 10%, and the cost of doing business is 25% of the sales, what is the per cent of profit on net cost?

\$66 less $33\frac{1}{3}\%$ and 5% = \$41.80, the net cost
$12 \times \$6$ = \$72, less 10% = \$64.80, the selling price
\$64.80 − \$41.80 = \$23, the gross profit
25% of \$64.80 = \$16.20, the cost of doing business
\$23 − \$16.20 = \$6.80, the net profit on the net cost
\$6.80 ÷ \$41.80 = $.16\frac{5}{9}\frac{6}{9}$, or $16\frac{5}{9}\frac{6}{9}\%$, the per cent of profit

Problems

1. A coat was bought for \$50, less 8% discount. It was sold for \$80, less $12\frac{1}{2}\%$ discount. If the cost of doing business was 25% of the sales, what was the per cent of profit on the net cost?

2. An article cost \$56, less $12\frac{1}{2}\%$ discount. Buying expenses amounted to 5% of the net cost. If it cost $25\frac{1}{2}\%$ of the sales to do business, what per cent of profit on the gross cost would be made by selling the article for \$80, less 5%?

3. Saws bought at \$33 a dozen were sold at \$4 each. If it cost $22\frac{1}{2}\%$ of the sales to do business, what was the per cent of net profit on the net cost?

Example.—A dealer bought shoes for \$8.80, less $12\frac{1}{2}\%$ and 10%. He sold them for \$11.00, less 10%. If his buying expenses were 3% of the net cost and his selling expenses were $17\frac{1}{2}\%$ of net sales, what per cent of the gross cost was his net profit?

\$11 less 10% = \$9.90, the selling price
\$8.80 less $12\frac{1}{2}\%$ and 10% = \$6.93, the net cost
\$6.93 + 3% (cost of buying) = \$7.13, the net cost
\$9.90 less $27\frac{1}{2}\%$ (cost of doing business) = \$8.17
\$8.17 − \$7.13 = \$1.04, the net profit
\$1.04 ÷ \$7.13 = .1458 or 14.58%, the per cent of profit on the gross cost

Problems

1. A table cost \$60, less $16\frac{2}{3}\%$ and 5%. It was sold for \$96, less $12\frac{1}{2}\%$. If the buying expenses were 5% of the net cost and the cost of doing business was 25% of the net sales, what per cent of the gross cost was the net profit?

2. A dealer bought a sewing machine for \$66, less 25%, and sold it for \$95, less 10%. If his buying expenses were \$1.50, and his selling expenses were $33\frac{1}{3}\%$ of the net sales, what per cent of the gross cost was the net profit?

3. A merchant paid \$18, less $16\frac{2}{3}\%$, for an article. He sold it for \$30, less 10%. If his buying expenses were 4% of the net cost and his selling expenses were 30% of the net sales, what per cent of the gross cost was his net profit?

4. An article was sold for \$100, less 20% and 10%. It cost \$40, net, and the buying expenses were 6% of net cost. If the cost of doing business was 21% of the net sales, what per cent of the selling price was the net profit?

5. A fur coat cost \$180, less $33\frac{1}{3}\%$. Buying expenses were $7\frac{1}{2}\%$ of the net cost and the cost of doing business was 22% of sales. What per cent net of sales was made by selling the coat for \$175 net?

To find the net cost and the cost of buying when the profit and per cent of buying cost are known.—

Example.—The per cent of profit on the gross cost of an article was $33\frac{1}{3}$. If the profit was \$9.27, and the cost of buying was 6%, what were (a) the net cost of the article, and (b) the cost of buying?

$33\frac{1}{3}\% = \$\ 9.27$, the profit
$\$\ 9.27 \div .33\frac{1}{3} = \$27.81$, the gross cost
100% (the net cost) + 6% (the cost of buying) = 106%, the gross cost
$\$27.81 \div 1.06\ (106\%) = \$26.24$, the net cost
$\$27.81 - \$26.24 = \$1.57$, the cost of buying

Proof:

\$26.24 + \$1.57 = \$27.81, the gross cost
$33\frac{1}{3}\%$ of \$27.81 = \$9.27, the profit

Problems

1. The per cent of profit on the gross cost of an article was 40. If the profit was \$16.80 and the cost of buying was 5% of the net cost, what was (a) the gross cost? (b) the selling price? (c) the cost of buying?

2. The per cent of profit on the gross cost of an article was 35, and the profit amounted to $14.70. If the cost of buying was $1.20, what was (a) the gross cost? (b) the net cost? (c) the selling price?

3. The profit from the sale of a garment was $20.80. If the profit was $33\frac{1}{3}\%$ of the gross cost, and the cost of buying was 4% of the net cost, what were (a) the gross cost, (b) the net cost, (c) the selling price, and (d) the cost of buying?

4. The per cent of profit on the gross cost of hats was 50, and the profit on a dozen was $18. The cost of buying was $1.20 a dozen. (a) What was the net cost? (b) For how much did each sell?

To find the per cent of profit and the selling price when the net cost, cost of buying, and amount of profit are given.—

Example.—The net cost of a hammock was $44. The buying expenses were 5% of the net cost. If the hammock sold at a profit of $15.40, what was the per cent of profit on the gross cost?

5% of $44 = $2.20, the buying expenses
$44 + $2.20 = $46.20, the gross cost
$15.40 ÷ $46.20 = $.33\frac{1}{3}$ = $33\frac{1}{3}\%$, per cent of profit on the gross cost

Problems

1. The net cost of a stove was $80. The freight and cartage was 6% of the net cost. The stove was sold at a profit of $21.20. (a) What was the per cent of profit on the gross cost? (b) What was the selling price?

2. The net cost of a hall clock was $166. The express charges were $14. The clock was sold at a profit of $90. (a) What was the per cent of profit on the gross cost? (b) What was the selling price?

3. The cost of a safe was $850, less 8% discount. The freight and cartage was $23.40. It was sold at a profit of $201.35 on the gross cost. (a) What was the per cent of profit? (b) What was the selling price?

4. The net cost of a kitchen cabinet was $148. The buying expenses were $12. It was sold at a profit of $64. Find (a) the per cent of profit on the gross cost; (b) the per cent of profit on the selling price.

TRADING STATEMENTS

A merchant's records show the following: inventory of merchandise at the beginning of the year, $22,480; purchases during the year, $38,424.20; returned purchases, $442.75; sales during the year, $49,412.20; returned sales, $372.30. He paid freight amounting to $421.60. Goods on hand at

the end of the year inventoried $23,328. What was his gross profit on sales?

Gross Sales		$46,412	
Less Returned Sales		372.30	
Net Sales			$46,039.70
Deduct Cost of Goods Sold			
Inventory at Beginning of Year		$22,480	
Purchases during the Year	$38,424.20		
Add Freight In	421.60		
Total	$38,845.80		
Less Returned Purchases	442.75		
Net Purchases		$38,403.05	
Total of Goods for Sale		$60,883.05	
Less Inventory at End of Year		23,328	
Cost of Goods Sold			$37,555.05
Gross Profit on Sales			$ 8484.65

Problems

1. Find the gross profit on sales from the following (arrange in correct form):

Gross sales	$54,902.60
Returned sales	461.70
Inventory at the beginning of year	24,872.35
Purchases during the year	43,421.50
Freight on goods purchased	295.40
Returned purchases	388.12
Inventory at end of year	23,378.45

2. From the following find (a) the gross profit on sales and (b) the per cent of profit on the cost of goods sold:

Gross sales	$34,328.20
Returned sales	315.35
Inventory at the beginning of year	18,360.75
Purchases during the year	28,112.30
Freight on goods purchased	307.15
Returned purchases	284.10
Inventory at the end of year	20,354.70

MANUFACTURING COSTS AND PROFITS

A manufacturer's costs may be divided as follows:

A. Production Costs:

1. Raw materials including delivery costs.
2. Wages and salaries of those employed in the production.

B. Overhead Expenses:

1. Rent.
2. Interest on capital.
3. Fuel, light, and insurance.
4. Salaries of executives and office employees.

C. Selling Expenses:

1. Commission.
2. Salaries of salesmen.
3. Advertising.
4. Boxing, carting, and sometimes express and freight on manufactured goods.

Problems

1. In producing 50,000 pairs of shoes selling at $4.50 a pair, the costs were distributed as follows: raw materials, $77,340; wages and salaries in production, $88,270; overhead expenses, $21,165; and selling expenses, $19,486. (a) Find the cost of one pair of shoes. (b) Find the gross profit on the 50,000 pairs. (c) What per cent of the whole manufacturing costs was the gross profit?

2. To manufacture 10,000 cloaks, the costs were distributed as follows: materials to use in production, $108,360; wages and salaries in production, $174,300; overhead expenses, $12,880; selling expenses, $17,550. The cloaks sold for $35 each. (a) Find the total cost of the 10,000 cloaks. (b) Find the cost of one cloak. (c) What per cent of the manufacturing costs was the gross profit?

3. In problem 1, (a) what per cent of the whole cost was the cost of raw material? (b) What per cent of the whole cost were the overhead expenses?

PRICE MARKING

Merchants very often find it advantageous to use a code in the "price marking" of goods which are for sale. It is quite generally the practice to use a code in marking the cost price. The selling price usually is marked in figures. Sometimes the code is used in marking both buying and selling prices.

Any word or phrase having ten different letters may be used as a code. Examples are:

W a n d e r l u s t	Y o u c a n l i v e
1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0
Repeater, X	Repeater, *Z*

The repeater is used where two figures coming together in a price are the same. Using the first code, "wanderlust," the cost price, $3.55, would be written **n.ex** instead of **n.ee.**

An article that cost $3.35 is marked to sell at $4.25.

By the code "wanderlust" it is marked $\frac{\text{n.xe}}{\text{4.25}}$; or by the code "You can live" it is marked $\frac{\text{u.za}}{\text{4.25}}$.

Both codes can be used at the same time. The code "wanderlust" can be used to mark the cost price, and the code "You can live," to mark the selling price: $\frac{\text{n.xe}}{\text{c.oa}}$.

There is no limit to the selecting and arranging of codes in price marking. As a means of making it more difficult for the customer to determine the code marking, a word like "wanderlust" may be arranged backwards:

t s u l r e d n a w
1 2 3 4 5 6 7 8 9 0

Problems

Using the code word "wanderlust" for the cost price and the code phrase "You can live" for the selling price, mark the prices of the following, in the form indicated—$\frac{\text{Cost price}}{\text{Selling Price}}$:

Cost Price	*Selling Price*	*Cost Price*	*Selling Price*
1. 3.25	5.00	**4.** 33.20	47.50
2. 7.14	9.75	**5.** 66.10	92.
3. 15.80	22.50	**6.** 157.25	225.

From the same codes, state the following prices in figures:

1. $\frac{\text{a.ne}}{\text{u.ae}}$ **2.** $\frac{\text{d.ru}}{\text{n.la}}$ **3.** $\frac{\text{de.rt}}{\text{ne.}}$ **4.** $\frac{\text{wne.rt}}{\text{yva.ze}}$

To find the marked price which, when discounted, will equal a certain selling price.—

Example.—A merchant bought an article for $40, less 10% and 2%. At what price must he mark it to make a profit of

25% on the net cost, and allow the purchaser a discount of 10% on the marked price?

\$40 less 10% and 2%	= \$35.28, the net cost
\$35.28 + 25% (\$8.82)	= \$44.10, the net selling price
100% (the marked price) − 10%	= 90%, the selling price
\$44.10 ÷ .90 (90%)	= \$49, the marked price

The marked price is equal to 100%, and the selling price is 90% of the marked price.

To find the marked price which, when discounted, will give a certain selling price, divide the net selling price by 100%, *less the given discount.*

Problems

1. An article is bought for \$80, less 25%, and marked to sell at a profit of 40% after allowing the purchaser a discount of 20%. Find the marked price.

2. An article is bought for \$90, less 20% and 5%. At what price must it be marked to sell, in order that a profit of 25% may be made and the customer be allowed a discount of 5%?

3. A merchant bought a couch hammock for \$66, less $33\frac{1}{3}$%. At what price must he mark it to make a profit of 50%, after allowing the purchaser 25% discount on the marked price?

4. A dealer bought a clock for \$120, less 25%. The buying costs amounted to 10% of the net cost. He marked the clock to sell at a profit of 40% of the gross cost after allowing the purchaser 20% discount. Find the marked price.

5. An agent bought a number of vacuum-cleaners for \$75 each, less 20%. The freight and cartage amounted to \$1.20 each. What price must he make to a customer to whom he offers a discount of 10%, so that he may still make a profit of 50% on the gross cost?

General Problems

1. A merchant bought an invoice of goods amounting to \$3180, less $33\frac{1}{3}$% and 3%. He sold these goods at the invoice price, less 8%. His profit was what per cent of the net selling price?

2. A certain merchant advertised that he would give automobile parking tickets good for $\frac{1}{2}$ day to all customers who traded in his store to the amount of \$15 or more. One customer bought \$18.75 worth of goods and received a parking ticket which cost the merchant \$.75. (a) What per cent of his profit on sales was taken to pay for this ticket? In one day his sales amounted to \$387.50 and he issued 20 parking tickets of 75¢ each. (b) What per cent of his sales was the cost of the parking tickets?

3. A dealer sent out a circular letter advertising furniture at $12\frac{1}{2}$% discount, and enclosed a coupon worth \$1.00 in trade. A customer pre-

sented a coupon and purchased a chair marked $24. The cash price which the customer paid for the chair was at what per cent discount on the marked price?

4. A manufacturer sells clocks at 20% discount and makes a profit of 25% on the cost of production. How much does he make on a clock listed at $45?

5. A dealer bought bath tubs at $85, less 25% and 20%. The buying charges amounted to $4 on each tub. He sold them at the list price, $85, less 10%. What per cent of profit did he make (a) on the gross cost? (b) on the selling price?

6. A wholesale dealer allowed 2% discount on all accounts paid by customers within 10 days. The discount allowed to one customer was $72.30. What was the net amount of his bill?

7. In the preceding problem, the dealer priced his goods to make a profit of 25% on the gross cost to him, before the discount was taken. How much was his net profit on this transaction?

8. At what selling price must articles that cost $54 a dozen be marked in order that a discount of 20% may be allowed and that they shall still show a profit of $33\frac{1}{3}$%?

9. Two articles were sold for $360 each. On one the profit was 20%, and on the other the loss was 20% on the cost. Was there a gain or a loss, and how much?

10. Fifty pounds of tea, costing 31¢ per pound, are mixed with 75 pounds of tea, costing 36¢ per pound. At what price per pound must the mixture be sold to gain 50% on the cost?

COMMISSION AND BROKERAGE

A **commission merchant,** or **broker,** is one who transacts business for another, called the **principal.**

The charge for this service is called the **commission,** or **brokerage.** This commission, or brokerage, is usually a certain price per unit of weight or measure, or a certain percentage of the cost or selling price.

A **guarantee** is an additional charge made by a commission merchant to cover his personal liability when he guarantees quality of the goods he buys or sells.

A **collection fee** is a service charge made by the commission merchant when he makes the collections for goods sold on account.

The **shipper** is the one shipping the goods to the commission merchant. He is called the **consignor,** and the goods shipped are called a **shipment.**

The commission merchant, when he receives goods to be sold, is the **consignee,** and the goods to be sold are the **consignment.**

The **gross proceeds** are the full amount from the collection or sale received by the commission merchant, or broker.

The **net proceeds** are the amount remaining after all the charges have been deducted.

An **account sales** is a statement prepared by the commission merchant showing the quantity, price, and amount of the sale, all items of expense, and the net proceeds.

An **account purchase** is a statement prepared by the commission merchant showing the items purchased, the price, the charges, and the total amount.

Problem

1. Copy this account sales in correct form and find the net proceeds to be remitted to Adam H. Thomas.

Account Sales

HARMON AND JOHNSON
COMMISSION MERCHANTS
68 Market Street
New York, N. Y.

SOLD FOR ACCOUNT OF
Adam H. Thomas
Lewiston, Maine

October 6, 19—

19—							
Oct.	1	1080 bu. Potatoes	$1.35				
Oct.	4	470 bu. Potatoes	1.32				
		Charges					
		Freight $234.; Handling	$77.50	311	50		
		Storage		23	50		
		Commission 2%					
		Net proceeds					
CD							

Form 1.

To find the net proceeds of a sale on commission when the gross proceeds and all the charges are given.—

Example.—An apple buyer shipped 1480 bbl. of apples to a commission merchant to be sold on commission. The merchant sold 1000 bbl. for $6.20 a barrel and 480 bbl. for $6.10 a barrel. The charges were as follows: freight, $188; cartage, $42; storage, $12; and commission, 2½%. Find the net proceeds.

1000 bbl. @ $6.20 = $6200
480 bbl. @ $6.10 = $2928
$6200 + $2928 = $9128, the total sales
2½% of $9128 = $228.20, the commission
$188 + $42 + $12 + $228.20 = $470.20, the total charges
$9128 − $470.20 = $8657.80, the net proceeds

Problems

1. A producer shipped 3128 bu. of onions to a commission merchant. The merchant sold 1200 bu. for $1.75 a bushel, 800 bu. for $1.80 a bushel, and the remainder for $1.70 a bushel. The charges were as follows: freight, $324.60; storage and handling, $115; commission, 3%. Find the net proceeds.

2. A commission merchant received from a producer 31 crates of eggs, containing 30 doz. each, to be sold on commission. The charges were: express, $27.90; storage, $7.75; commission, 3%; and guaranty, 1%. The sales were as follows: 300 doz. at 54¢ a dozen; 400 doz. at 53¢ a dozen; and the remainder at 51¢ a dozen. Find the net proceeds.

3. A cotton dealer shipped 48 bales of cotton, weighing 24,000 lb. net, to a commission merchant in New Orleans to be sold on commission. The freight charges were $88.60; storage and handling, $36; commission, 3%; and collection, ½%. The cotton was sold for 23¢ a pound. Find the net proceeds.

4. A grain buyer shipped 12 carloads, 8924 bu., of wheat to a Chicago commission merchant to be sold on commission. The wheat was sold for $1.85 a bushel. The freight charges were $1608, and the commission merchant charged 2¢ a bushel for selling. Find the net proceeds.

5. A consignment of 1566 bbl. of flour was received by a commission merchant. He paid freight, $1288; cartage, $157 and storage, $78.30. The sales were as follows: 900 bbl. at $8.15 a barrel; 400 bbl. at $8.08 a barrel; and the remainder at $8 a barrel. The merchant charged 2% for selling and ½% for guaranty. Find the net proceeds.

To find the total cost of a purchase on commission when the price of the goods and all the charges are given.—

Problem

1. Copy the following account purchase in correct form and find the total charged to Martin Kenlon's account:

Account Purchase

HENDERSON AND SONS
COMMISSION MERCHANTS
38 State Street
Boston, Mass.

PURCHASED FOR ACCOUNT OF — October 10, 19—
Martin Kenlon
Hartford, Conn.

19—							
Oct.	5	1500 lb. E. B. Tea	41¢				
Oct.	5	750 lb. R. P. Tea	43				
Oct.	5	750 lb. U. H. Tea	38¢				
		Charges					
		Cartage			15		
		Commission 2½%					
		Total charged to your account					
		JN					

Form 2.

To find the total of an account purchase:

1. *Multiply the quantity of goods purchased by the price in each case, and then find the total.*

2. *Add to this total the sum of all charges.*

Problems

1. A commission merchant in Philadelphia bought for the account of D. W. Howe, Denver, Col., 500 lb. R. cheese, at 28½¢ a pound; 300 lb. S. cheese, at 31¼¢ a pound; and 250 lb. L. cheese, at 36¢ a pound. The charges for packing and shipping were $5.25 and the commission for buying was 3%. Find the total of this account.

2. A commission merchant purchased for his principal, 36 tubs of butter, averaging $54\frac{1}{2}$ pounds each, for 47¢ a pound. He charged 3% commission and the other expenses amounted to $9. Find the total cost of the butter.

3. A merchant sent an order to a commission merchant to purchase 2000 lb. of rice and 300 bags, 100 lb. each, of sugar. The rice was purchased for $5\frac{1}{4}$¢ a pound and the sugar for $4\frac{3}{8}$¢ a pound. The commission was $2\frac{1}{2}$% and the other charges amounted to $12.50. Find the total cost.

To find the quantity sold and the net proceeds of a commission sale when the selling price and all charges are given.

Example.—The commission, at 3%, for selling oranges at $7.80 a crate amounted to $58.50. Other charges amounted to 55¢ a crate. (a) How many crates were sold? (b) How much were the net proceeds?

	$58.50 ÷ .03 (3%)	= $1950, amount of sales
(a)	$1950 ÷ $7.80	= 250, the number of crates
	250 × 55¢	= $137.50, the other charges
	$58.50 + $137.50	= $196, the total charges
(b)	$1950 − $196	= $1754, the net proceeds

Problems

1. A commission merchant charged 3%, which amounted to $146.34, for selling potatoes at 90¢ a bushel. (a) How many bushels did he sell? (b) How much were the net proceeds if the other charges amounted to $267.50?

2. A commission merchant earned $137.50 by charging $2\frac{1}{2}$% for selling apples at $5.50 a barrel. (a) How many barrels did he sell? (b) If he remitted $5028.60 to his principal, how much were the other charges?

3. A commission merchant sold 1800 lb. of butter. His commission at 4% amounted to $34.56. (a) For how much a pound did he sell the butter? (b) If the other charges amounted to $27, how much were the net proceeds?

4. A commission merchant, at $3\frac{1}{2}$%, charged $51.80 for buying oranges at $3.70 a crate. (a) How many crates did he buy? (b) If the other charges amounted to $12\frac{1}{2}$¢ a crate, how much did the oranges cost the principal?

5. The rate of commission was $2\frac{1}{2}$% and the commission charged for buying sweet potatoes amounted to $10.80. (a) How many barrels were purchased at $5.40 a barrel? (b) If the other charges amounted to $28.80, how much a barrel did the potatoes cost the principal?

General Problems

1. What amount must a principal remit to his agent to pay for 50 bales of cotton, weighing on an average 500 lb. to the bale, at $14\frac{1}{2}¢$ a pound, if the agent charged 3% commission for buying and the other charges amounted to $25?

2. An agent purchased flour for his principal at $6.75 a barrel. The commission at 4% amounted to $67.50. Other charges were $37.50. (a) How many barrels of flour did the agent buy? (b) How much per barrel did the flour cost the principal?

3. A salesman's commissions for a month, at 5%, amounted to $347.50. Find (a) his gross sales, and (b) his net sales for the month.

4. An insurance agent receives 50% of the first annual premium for writing insurance. On a certain policy which he wrote, the premium was $96 a thousand and his commission was $384. What was the amount of the policy?

5. A commission merchant sold 4870 lb. of wool for his principal. After deducting his commission of $3\frac{1}{2}$%, the net proceeds amounted to $1879.82. How much per pound did he get for the wool?

6. An agent received $1390.50 from his principal with instructions to buy pork at $18 per 100 pounds. The agent charged 3% for buying. How many pounds did he buy? (Divide the amount remitted by the total cost of 100 pounds.)

7. How many crates of oranges, at $3.50 a crate, can be purchased with $224.40, if the agent charged 4% for buying and the other charges amounted to $6? (Deduct the charges from the whole amount before dividing by the cost of one crate.)

8. A country merchant sent 40 crates of eggs, of 30 doz. each, and 920 lb. of butter to a commission merchant with instructions to sell the eggs and butter and to buy for his account 300 lb. of E. B. tea, 450 lb. of Rio coffee and 15 bags, or 1500 pounds, of sugar. The commisssion merchant paid $23.20 freight on the eggs and the butter. He sold the eggs for 45¢ a dozen, and the butter for 56¢ a pound. He paid 42¢ a pound for the tea, 23¢ a pound for the coffee, and $5\frac{1}{3}¢$ a pound for the sugar. The agent charged 3% commission for both buying and selling. Show how this account stands.

INTEREST

There are three kinds of interest: **ordinary interest, accurate interest,** and **compound interest.**

Ordinary interest is simple interest figured on a basis of 360 days in a year.

Accurate interest is interest figured for the exact number of days on a basis of 365 days in a year.

Compound interest is interest repeatedly figured on accumulated interest, period after period.

Practically every state in the United States has an established interest rate, known as the **legal rate.** These rates vary in the different states from 5% to 8%. Charging more than the legal rate is called **usury.** In most of the states a penalty is imposed for this practice.

The methods for figuring interest are commonly referred to as the **ordinary method;** the **exact,** or **accurate method,** and the **bankers' method.** The difference in these methods consists in the way the time is reckoned.

Regardless of the method used in finding interest, every method resolves itself into the following formula or is a deduction from it.

$$\text{Principal} \times \frac{\text{Time}}{\text{Year}} \times \frac{\text{Rate}}{100} = \text{Interest.}$$

(360 or 365 days)

The principal multiplied by the time, expressed as a fraction of a year, and then multiplied by the rate over 100 *will give the interest.* The result will vary according to whether the ordinary, exact, or bankers' method of finding the time is used.

Finding the Time

In finding the due date, or the time, a current calendar should be used. It should be kept in mind that when the due date falls on a Sunday or on a holiday, the next business day is the due date, and this extra time is counted.

In banking circles, in some localities, Saturday is considered a holiday.

To find the time by the ordinary method.—

In the ordinary method of finding the time, a year is considered as having 12 months of 30 days each, or 360 days.

Example.—Find the time between April 14, 1927, and March 6, 1929.

By compound subtraction:

Year	Month	Day
1929	3	6
1927	4	14
1	10	22

Borrow 1 mo. Then 30 days (1 mo.) + 6 days = 36 days − 14 days = 22 days. Borrow 12 mo. Then 12 mo. (1 yr.) + 2 mo. remaining = 14 mo. − 4 mo. = 10 mo. The 1 yr. borrowed from 1929 leaves 1928, and 1928 − 1927 = 1 yr. The result is 1 yr., 10 mo., and 22 days.

Problems

By compound subtraction find the time between:

1. June 16, 1926, and August 24, 1928.
2. September 11, 1927, and July 15, 1928.
3. December 10, 1926, and October 8, 1928.
4. November 13, 1925, and May 11, 1928.
5. October 15, 1924, and February 8, 1929.
6. July 27, 1925, and May 12, 1929.
7. February 16, 1926, and June 10, 1929.
8. March 4, 1927, and November 2, 1929.

To find the time by the exact method.—

In finding the exact time, the actual number of days in each month is counted.

Example.—Find the exact time from June 4, 1928, to January 7, 1929.

June,	26	days
July,	31	"
Aug.,	31	"
Sept.,	30	"
Oct.,	31	"
Nov.,	30	"
Dec.,	31	"
Jan.,	7	"
	217	"

In this problem, the time is counted from June 4, leaving 26 days in June. Jan. 7 is counted.[1]

Problems

Find the exact time between:

1. Oct. 16 and Jan. 5.
2. May 7 and Aug. 15.
3. July 14 and Nov. 12.
4. Apr. 11 and Aug. 2.
5. Mar. 4 and Nov. 6.
6. Feb. 16 and July 9.

To find the time by the bankers' method.—

By the bankers' method, the time is expressed in months and days, or in days only. This method is used to find the time for short periods. For example, the time from June 7 to October 25 is reckoned as 4 months and 18 days.

In the year there are 365 days, but in figuring ordinary interest the 360-day year is used. This is done to simplify the process. Hence, the exact year is $\frac{5}{360}$, or $\frac{1}{72}$, more than the ordinary year; and the ordinary year is $\frac{5}{365}$, or $\frac{1}{73}$, less than the exact year. For this reason, the banker or any one else who loans money and counts the exact time when reckoning his interest on a basis of 360 days in a year, gets a little more interest than he otherwise would.

The following illustrations show the three methods of calculating interest:

Examples.—Find the interest on $2000 at 6% from Nov. 16, 1928, to April 8, 1929.

1. By the Ordinary Method:

Year	Month	Day
1929	4	8
1928	11	16
	4	22 = 142 days

$\$2000 \times \frac{142}{360} \times \frac{6}{100} = \$47.33$, the interest

By this method, a year is considered as having 12 months of 30 days each, or 360 days.

[1] It is the practice in some localities, when commercial paper is discounted, to count the first date and also the last date.

2. By the Exact Method:

Nov., 14 days remaining
Dec., 31 days
Jan., 31 days
Feb., 28 days
Mar., 31 days
Apr., 8 days
143 days

$\$2000 \times \frac{143}{365} \times \frac{6}{100} = \$46.85$, the interest

By this method the exact time is counted and 365 days are used for the year.

3. By the Bankers' Method:

$\$2000 \times \frac{143}{360} \times \frac{6}{100} = \$47.67$ int.

By this method the bankers' time is counted and 360 days are used for the year.

Note that, of these three procedures, the exact method produces the least interest and the bankers' method produces the most.

Methods for Figuring Interest

The 60-day method and the 1-day method have been treated at length earlier in this work and they will only be reviewed at this time.

To find the interest at 6% on any principal for 60 days, point off two places.

Example.—Find the interest on \$375.50 for 147 days at 6%.

\$3.755 , the int. for 60 days at 6%
\$7.51 , the int. for 120 days at 6%
2.50 , the int. for 20 days at 6%
.375 , the int. for 6 days at 6%
.0625, the int. for 1 day at 6%
\$10.4475, the int. for 147 days at 6%
or
\$10.45

Problems

Find the interest at 6% on:

1. \$580 for 96 days
2. \$1270 for 123 days
3. \$1590 for 72 days
4. \$725 for 115 days
5. \$966 for 148 days
6. \$2160.60 for 129 days
7. \$3725.80 for 153 days
8. \$5920 for 75 days
9. \$1678.90 for 45 days
10. \$7288 for 15 days

Example.—Find the interest at 6% on \$1236.50 for 4 mo., 24 days (2 mo. = 60 days).

\$12.365, the int. for 2 mo. at 6%
\$24.73 , the int. for 4 mo. at 6%
4.946, the int. for 24 days at 6%
\$29.68 , the int. for 4 mo., 24 days., at 6%
24 days = four 6-day periods.

Problems

Find the interest at 6% on:

1. \$198 for 4 mo., 18 days
2. \$378.60 for 6 mo., 15 days
3. \$760.80 for 5 mo., 20 days
4. \$1120 for 3 mo., 12 days
5. \$954.30 for 2 mo., 23 days
6. \$1750 for 5 mo., 17 days
7. \$2160.70 for 4 mo., 16 days
8. \$3968 for 7 mo., 15 days
9. \$4670 for 3 mo., 11 days
10. \$5480 for 6 mo., 9 days

Example.—Find the interest at 6% on \$2480 for 2 yr., 3 mo., 21 days. (The process will be simplified by taking 2 yr. as 24 mo. Then 24 + 3 = 27 mo.)

\$24.80, the int. for 2 mo. at 6%
\$334.80 (\$24.80 × $13\frac{1}{2}$), the int. for 27 mo. at 6%
8.2666 (\$24.80 × ($\frac{20}{60}$, or $\frac{1}{3}$), the int. for 20 days at 6%
.4133 (\$2.48 × $\frac{1}{6}$), the int. for 1 day at 6%
\$343.48, the int. for 2 yr., 3 mo., 21 days at 6%

Results should be carried out to four places, in order to insure accurate final results.

Problems

Find the interest at 6% on:

1. \$1550 for 1 yr., 4 mo., 15 days.
2. \$770.40 for 2 yr., 2 mo., 18 days.
3. \$975 for 3 yr., 5 mo., 25 days.
4. \$2460 for 1 yr., 3 mo., 9 days.
5. \$228.90 for 2 yr., 6 mo., 7 days.
6. \$3128.80 for 1 yr., 7 mo., 24 days.
7. \$4960 for 2 yr., 1 mo., 12 days.
8. \$5750 for 1 yr., 9 mo., 5 days.
9. \$1250 for 2 yr., 10 mo., 6 days.
10. \$1800 for 1 yr., 11 mo., 27 days.

Example.—Find the interest at $4\frac{1}{2}\%$ on \$3650 for 1 yr., 6 mo., 10 days. (1 yr., 6 mo. = 18 mo.)

\$ 36.50, the int. for 2 mo. at 6%
\$328.50, the int. for 18 mo. at 6% ($\frac{18}{2}$ or 9 × \$36.50)
\$ 6.0833, the int. for 10 days at 6% ($\frac{10}{60}$ or $\frac{1}{6}$ × \$36.50)
\$334.5833, the int. for 1 yr., 6 mo., 10 days at 6%
\$334.5833 ÷ 6 = \$55.7638+, the int. at 1%
\$ 55.7638 × $4\frac{1}{2}$ = \$250.9371, or \$250.94, the int. at $4\frac{1}{2}\%$

To find the interest at any rate other than 6%, divide the interest at 6% by 6 to find the interest at 1%. This result multiplied by the rate given will give the required result. Or, where the given rate is less than 6%, subtract it from 6 and take as many sixths as the difference shows, from the interest at 6%. Where the given rate is more than 6%, add as many sixths as the difference shows, to the interest at 6%.

Examples.—

1. To find the interest at 5%: 6 − 5 = 1; $\frac{1}{6}$ of the interest of 6% subtracted therefrom will give the interest at 5%.

2. To find the interest at $7\frac{1}{2}\%$: $7\frac{1}{2} - 6 = 1\frac{1}{2}$, $\frac{1\frac{1}{2}}{6} = \frac{3}{12} = \frac{1}{4}$; $\frac{1}{4}$ of the interest at 6% added thereto will give the interest at $7\frac{1}{2}\%$.

(Refer to the table for finding interest at different rates, given under "Simple Interest" on pages 66–67.)

For short methods which may be applied, refer to "The 60-day Method" under "Simple Interest," on page 63.

Problems

Find the interest on the following at the rates given:

1. \$6000 for 7 mo., 15 days at 5%.
2. \$3260 for 5 mo., 24 days at 7%.
3. \$780 for 4 mo., 20 days at $4\frac{1}{2}$%.
4. \$1520.60 for 6 mo., 9 days at $7\frac{1}{2}$%.
5. \$2500 for 3 mo., 18 days at 4%.
6. \$5750 for 8 mo., 26 days at 8%.
7. \$9250 for 1 mo., 10 days at $8\frac{1}{2}$%.
8. \$12,500 for 5 mo., 6 days at $3\frac{1}{2}$%
9. \$4500 for 9 mo., 25 days at 9%.

Interchanging time and principal will sometimes simplify the process.

Example.—Find the interest at 6% on \$1500 for 43 days. (\$43 for 1500 days.)

\$ .43, the int. for 60 days at 6%
\$10.75, the int. for 1500 days at 6%
1500 ÷ 60 = 25, and 25 × 43¢ = \$10.75

Problems

Solve the following by interchanging time and principal:

1. \$1200 for 57 days at 6%.
2. \$3600 for 78 days at 6%.
3. \$9000 for 49 days at 6%.
4. \$4800 for 121 days at 6%.
5. \$5400 for 17 days at 6%.
6. \$6600 for 38 days at 6%.
7. \$2400 for 87 days at 6%.
8. \$1800 for 137 days at 6%.
9. \$2100 for 101 days at 6%.
10. \$7200 for 35 days at 6%.

Example.—Find the interest and the amount, at 6%, on \$2840 for 5 mo., 16 days.

\$28.40, the int. for 2 mo. at 6%
\$71. , the int. for 5 mo. at 6%
7.10, the int. for 2 mo. at 6%
.47$\frac{1}{3}$, the int. for 1 day at 6%
\$78.57$\frac{1}{3}$, the int. for 5 mo. 16 days at 6%
\$2840 + \$78.57 = \$2918.57, the amount

Problems

Find the amount on each of the following:

1. \$3500 for 7 mo., 24 days at 6%.
2. \$7000 for 115 days at 5%.
3. \$2750 for 3 mo., 18 days at 7%.
4. \$3000 for 5 mo., 12 days at $4\frac{1}{2}$%.
5. \$1500 for 129 days at $7\frac{1}{2}$%.
6. \$900 for 4 mo., 21 days at $5\frac{1}{2}$%.

The bankers' method.—

Example.—Find the interest on \$2750 at 6% from Dec. 15, 1928, to Apr. 7, 1929. The bankers' interest time from Dec. 15 to Apr. 7 is 114 days. (Apr. 7 is on Sunday.)

\$27.50, the int. for 60 days at 6%
13.75, the int. for 30 days at 6%
11.00, the int. for 24 days at 6% (The int. for 6 days, \$2.75 × 4 = \$11.)
\$52.25, the interest for 114 days at 6%

Problems

Using the calendar for the current year, find by the bankers' method, the time, and the interest on:

1. \$ 2500 from Nov. 16 to Feb. 4 at 6%.
2. \$ 4000 from July 1 to Dec. 6 at 5%.
3. \$ 6600 from May 9 to Sept. 14 at 4%.
4. \$ 1800 from Apr. 5 to Aug. 2 at 7%.
5. \$ 4400 from June 6 to Oct. 9 at 6%.
6. \$ 500 from Mar. 19 to July 15 at 5%.
7. \$ 900 from Oct. 11 to Jan. 16 at 6%.
8. \$ 7500 from Nov. 17 to Mar. 10 at 6%.
9. \$12,000 from Feb. 7 to Sept. 5 at 5%.
10. \$25,000 from Sept. 1 to Apr. 1 at 4%.

Accurate interest.—

In computing **accurate interest,** the exact time in days is counted on a basis of the 365-day year.

When the ordinary interest has been found for the exact time, the accurate interest can be found by deducting from the ordinary interest $\frac{1}{73}$ of itself; or the method here illustrated can be used.

Example.—Find the accurate interest at 6% on \$450 for 158 days (from July 1 to Dec. 6).

$$\overset{9\cancel{0}}{\cancel{\$450}} \times \frac{158}{\cancel{365}\ 73} \times \frac{6}{10\cancel{0}} = \frac{8532}{730} = \$11.687+, \text{ or } \$11.69, \text{ the interest}$$

Problems

Find the accurate interest on:

1. \$1100 for 170 days at 6%.
2. \$1500 for 122 days at 5%.
3. \$ 730 for 65 days at 6%.
4. \$2500 for 142 days at 4%.
5. \$7000 for 35 days at $5\frac{1}{2}$%.
6. \$3500 for 75 days at $4\frac{1}{2}$%.
7. \$4000 for 121 days at 6%.
8. \$5600 for 85 days at 5%.
9. \$ 950 for 125 days at 6%.
10. \$1800 for 57 days at 4%.

COMPOUND INTEREST[1]

To find the amount of compound interest due on an account, when the principal, rate of interest, and time are given.—

Example.—Find the compound interest, compounded annually, on \$1500 for 4 yr. at 6%.

\$1500 × .06 = \$90, the int. for first period
\$1500 + \$90 = \$1590, the new principal
\$1590 × .06 = \$95.40, the int. for second period
\$1590 + \$ 95.40 = \$1685.40, the new principal
\$1685.40 × .06 = \$101.124, the int. for fourth period
\$1685.40 + \$101.12 = \$1786.52, the new principal
\$1786.52 × .06 = \$107.1912, the int. for fourth period
\$1786.52 + \$107.19 = \$1893.71, the new principal
\$1893.71 (the amount) − \$ 1500 = \$393.71, the compound interest

Problems

Find the compound interest on:

1. \$2500 for 3 yr. at 5%
2. \$4000 for 5 yr. at 4%
3. \$5000 for 4 yr. at 6%
4. \$1250 for 3 yr. at 6%
5. \$1000 for 4 yr. at 6%, semiannually.

Interest Tables

Interest tables are used extensively by banks, insurance companies, and many other business organizations having much interest to figure. Tables for time, ordinary interest,

[1] The law does not, as a rule, sanction the collection of compound interest on debts. It is used principally by savings banks, and saving departments of other banks, in figuring the interest on depositors' balances.

accurate interest, and compound interest are available at some stationery stores, and many publishers sell them. Any bank can give full information.

The following table shows the amount of $1 compounded annually at the different rates:

Years	3%	3½%	4%	4½%	5%	6%
1	1.030000	1.035000	1.040000	1.045000	1.050000	1.060000
2	1.060900	1.071225	1.081600	1.092025	1.102500	1.123600
3	1.092727	1.108718	1.124864	1.141166	1.157625	1.191016
4	1.125509	1.147523	1.169859	1.192519	1.215506	1.262477
5	1.159274	1.187686	1.216653	1.246182	1.276282	1.338226
6	1.194052	1.229255	1.265319	1.302260	1.340096	1.418519
7	1.229874	1.272279	1.315932	1.360862	1.407100	1.503630
8	1.266770	1.316809	1.368569	1.422101	1.477455	1.593848
9	1.304773	1.362897	1.423312	1.486095	1.551328	1.689479
10	1.343916	1.410599	1.480244	1.552969	1.628895	1.790848
11	1.384234	1.459970	1.539454	1.622853	1.710339	1.898299
12	1.425761	1.511069	1.601032	1.695881	1.795856	2.012197
13	1.468534	1.563956	1.665074	1.772196	1.885649	2.132928
14	1.512590	1.618695	1.731676	1.851945	1.979932	2.260904
15	1.557967	1.675349	1.800944	1.935282	2.078928	2.396558
16	1.604706	1.733986	1.872981	2.022370	2.182875	2.540352
17	1.652848	1.794676	1.947901	2.113377	2.292018	2.692773
18	1.702433	1.857489	2.025817	2.208479	2.406119	2.854339
19	1.753506	1.922501	2.106849	2.307860	2.526950	3.025600
20	1.806111	1.989789	2.191123	2.411714	2.653298	3.207136
21	1.860295	2.059431	2.278768	2.520241	2.785963	3.399564
22	1.916103	2.131512	2.369919	2.633652	2.925261	3.603537
23	1.973587	2.206114	2.464716	2.752166	3.071524	3.819750
24	2.032794	2.283328	2.563304	2.876014	3.225100	4.048935
25	2.093778	2.363245	2.665836	3.005434	3.386355	4.291871

Example.—Find the compound interest on $2000 for 8 years at 5%.

$1 compounded annually at 5% for 8 years amounts to $1.477455

$2000 \times \$1.477455 = \$2954.91$

$\$2954.91 - \$2000 = \$\ 954.91$

If the interest is compounded semiannually, take ½ the rate for twice the time.

If the interest is compounded quarterly, take $\frac{1}{4}$ *the rate for* 4 *times the time.*

The following table shows the amount of $1 placed annually at compound interest for any number of years to 25 inclusive:

Years	2%	3%	4%	4½%	5%	6%
1	1.020000	1.030000	1.040000	1.045000	1.050000	1.060000
2	2.060400	2.090900	2.121600	2.137025	2.152500	2.183600
3	3.121608	3.183627	3.246464	3.278191	3.310125	3.374616
4	4.204040	4.309136	4.416323	4.470710	4.525631	4.637093
5	5.308121	5.468410	5.632975	5.716892	5.801913	5.975319
6	6.434283	6.662462	6.898294	7.019152	7.142008	7.393838
7	7.582969	7.892336	8.214226	8.380014	8.549109	8.897468
8	8.754628	9.159106	9.582795	9.802114	10.026564	10.491316
9	9.949721	10.463879	11.006107	11.288209	11.577893	12.180795
10	11.168715	11.807796	12.486351	12.841179	13.206787	13.971643
11	12.412090	13.192030	14.025805	14.464032	14.917127	15.869941
12	13.680332	14.617790	15.626838	16.159913	16.712983	17.882138
13	14.973938	16.086324	17.291911	17.932109	18.598632	20.015066
14	16.293417	17.598914	19.023588	19.784054	20.578564	22.275970
15	17.639285	19.156881	20.824531	21.719337	22.657492	24.672528
16	19.012071	20.761588	22.697512	23.741707	24.840366	27.212880
17	20.412312	22.414435	24.645413	25.855084	27.132385	29.905653
18	21.840559	24.116868	26.671229	28.063562	29.539004	32.759992
19	23.297370	25.870374	28.778079	30.371423	32.065954	35.785591
20	24.783317	27.676486	30.969202	32.783137	34.719252	38.992727
21	26.298984	29.536780	33.247970	35.303378	37.505214	42.392290
22	27.844963	31.452884	35.617889	37.937030	40.430475	45.995828
23	29.421862	33.426470	38.082604	40.689196	43.501999	49.815577
24	31.030300	35.459264	40.645908	43.565210	46.727099	53.864512
25	32.670906	37.553042	43.311745	46.570645	50.113454	58.156383

Example.—Find the amount of $5, placed annually for 10 years, at 5% compound interest.

The amount of $1 placed at interest annually for ten years, at 5% compound interest, is $13.206787.

$$\$5 = 5 \times \$13.206787 = \$66.0333935,$$

or $66.03, the amount

Problems

1. If $50 is deposited every year in a savings account paying 4% compound interest, how much will be the balance at the end of 20 years?

2. Find the compound interest at 6% on $500 for 15 years.

3. A man paid a premium of $45 annually for 20 years on a life insurance policy of $1000. How much would this premium amount to in 20 years at 4% compound interest?

4. A business firm set aside annually, out of profits, $5000 for 20 years to provide for expanding the business. What would this amount to at $4\frac{1}{2}$% compound interest, compounded annually?

To find the principal when the time, rate, and interest are given.—

Example.—Find the principal that will yield $15 int. in 66 days at 6%.

$1 for 66 days at 6% = $.011, the int. on $1
$15 ÷ $.011 = $1363.64, the principal.

Problems

What principal will produce:

1. $19.80 int. at 6% for 72 days?
2. $12 int. at 6% for 96 days?
3. $9.45 int. at 6% for 126 days?
4. $15.63 int. at 6% for 75 days?

To find the time when the principal and the rate are given.—

Example.—In what time, at 6%, will $1500 produce $22.50?

$1500 × .06 = $90, the int. for 1 yr.
$22.50 ÷ $90 = .25
360 days × .25 = 90 days, the ordinary time
365 days × .25 = $91\frac{1}{4}$ days, the exact time

(The time would be 92 days)

Problems

In what time will:

1. $600 produce $12 at 6%?
2. $850 produce $21.25 at 6%?
3. $1200 produce $9 at 6%?
4. $1800 produce $72 at 6%?

To find the rate when the principal and the time are given.—

Example.—At what rate will \$900 produce \$13.50 int. in 90 days?

\$900 at 1% for 90 days = \$2.25, the int. at 1%
\$13.50 ÷ \$2.25 = 6, or 6%, the rate

Problems

At what rate will:

1. \$1200 produce \$25.20 in 126 days?
2. \$650 produce \$10.40 in 96 days?
3. \$1560 produce \$19.50 in 75 days?
4. \$2400 produce \$14.40 in 36 days?

CREDITS

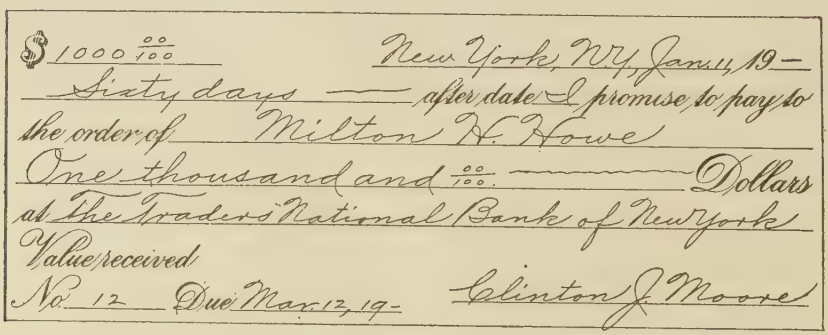
We have learned under "Trade and Cash Discounts" that credits are established through "charge accounts." Another means of establishing credits is through the written promise or order to pay a certain sum of money to a certain party at some definite future time.

These written promises, which are used so extensively, are known in business practice as **negotiable paper.**

Negotiable paper includes **notes, drafts, bonds** and many other credit instruments.

The particular kinds with which we are concerned in the study of arithmetic are those to which interest and bank discount apply. They are, in this connection, the **note** and the **time draft.** (Bonds will be treated later.)

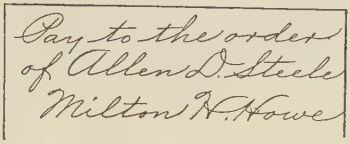
Notes.—The following is an illustration of a note:


\$1000 00/100 New York, N.Y., Jan. 11, 19—
Sixty days after date I promise to pay to
the order of Milton H. Howe
One thousand and 00/100 Dollars
at The Traders' National Bank of New York
Value received
No. 12 Due Mar. 12, 19— Clinton J. Moore

Form 3.

This is the interest-bearing note of Clinton J. Moore, the maker, to Milton H. Howe, the payee. It is an unconditional promise in writing to pay a definite sum of money at a determinable future time.

In case Milton H. Howe desired to transfer this note to another person, he could do so by endorsing it on the back as shown in form 4.


Pay to the order of Allen D. Steele
Milton H. Howe

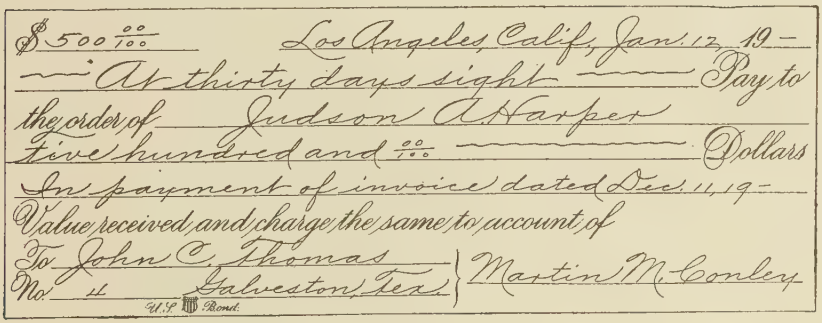
Form 4.

This is a full endorsement. In case Allen D. Steele wishes to transfer this note to another party, it will be necessary for him also to endorse it.

There are several kinds of endorsements, but the most common are the **full endorsement,** as illustrated, and the **blank endorsement,** which consists of the payee's name only. When any negotiable paper has been endorsed in full, it must be endorsed by the endorsee (the new owner) before it can be transferred to another party. When the blank endorsement is used, the paper becomes payable to bearer and does not have to be endorsed again in order to transfer it to someone else.

The one who endorses negotiable paper guarantees that it is a good contract in every respect; that he is the rightful owner, and that he has a good title thereto; and that he will pay the amount of the paper when due, in case the maker fails to pay.

Time drafts.—Here is a sample time draft:


$500 00/100 Los Angeles, Calif, Jan. 12, 19—
At thirty days sight Pay to
the order of Judson A. Harper
Five hundred and 00/100 Dollars
In payment of invoice dated Dec. 11, 19—
Value received and charge the same to account of
To John C. Thomas
No. 11 Galveston, Tex.
Martin M. Conley
U.S. Bond.

Form 5.

This is a three-party time draft. Martin M. Conley is the maker, Judson A. Harper is the payee, and John C. Thomas is the drawee. Mr. Thomas is expected to accept this draft when it is presented to him by Judson A. Harper. He will do this by writing across the face (front) of this draft:

Accepted January 15, 19—

John C. Thomas

After this draft is accepted, it is in effect the same as a thirty-day promissory note. It has thirty days after January 15 to run, and it would be possible for Mr. Harper to have it discounted at the bank where he does business.

In the case of the above draft, John Thomas owes Martin Conley $500. Conley, in turn, owes Judson Harper $500, and he has drawn the draft on Thomas and made it payable to Harper. Possibly Mr. Conley purchased goods from Mr. Harper and settled for them by giving this draft on Mr. Thomas, or possibly Mr. Harper is to act as an agent in collecting this draft for Mr. Conley.

Where a draft is used as a means of collecting an account, it is usually made payable to the order of "myself," signed by the maker and by him endorsed over to a bank which will act as agent in collecting the draft. The bank charges a small fee for this service, called **collection.**

The following is an example of a trade acceptance:

TRADE ACCEPTANCE

No. 28 New York, N.Y. Jan 15, 19—

To C.H. Bennett & Co 312 State St, Chicago, Ill

On May 18, 19— Pay to the order of Ourselves

Seven hundred eighty-five 00/100 Dollars ($785.00)

The obligation of the acceptor hereof arises out of the purchase of goods from the drawer. The drawer may accept this bill payable at any bank, banker or trust company in the United States which he may designate.

Accepted at Chicago on May 18, 19—

Payable at First National Bank

Bank's location 416 State St

Buyer's Signature C.H. Bennett & Co

By Agent or Officer C.H. Bennett Pres

James E. Lowery & Co

By J. E. Lowery

Form 6.

This trade acceptance was accepted by C. H. Bennett & Co. on January 18; therefore, it becomes due four months later, or on May 18, 19—.

The trade acceptance is a two-name draft; its use is restricted to the settling of accounts between the buyer and the seller of merchandise. It may be discounted, at a bank, for the payee.

BANK DISCOUNT

Bank discount is simple interest[1] collected in advance by a bank or banker, who accepts negotiable paper from its owner for discount before maturity.

The **discount** is the bankers' charge for advancing payment on the paper.

The **due date,** or **date of maturity,** is the date on which the paper becomes due and payable.

The **discount period** is the time between the date of discount and the date of maturity. As already explained, bankers count the exact time and allow an extra day for paper falling due on a Sunday or on a legal holiday. (See page 69.)

The two classes of paper offered for discount are interest-bearing paper and non-interest-bearing paper.

To find the discount period, or term of discount, and the date of maturity.—

To find the date of maturity:

1. *Where the time is given in days* (60 *days,* 90 *days, etc.*), *count ahead from the date of the paper the number of days given. Where the time is given in years or months, count ahead from the date of the paper the number of years or months given.*

2. *The difference in time between the date of discount and the date of maturity is the term of discount.*

[1] Nearly all banks use tables for computing the time and for computing the interest and the discount.

Example.—Find the date of maturity and the term of discount of a four-months' note, dated June 17 and discounted July 10.

June 17 + 4 mo. = Oct. 17, the date of maturity
From July 10 to Oct. 17 = 99 days, the term of discount

Problems

Find the date of maturity and the term of discount for the following:

	Date	*Time*	*Due Date*	*Date of Dis.*	*Term of Dis.*
1	Mar. 9	90 days		Apr. 1	
2	June 6	4 months		July 17	
3	May 4	3 months		June 1	
4	Jan. 15	60 days		Jan. 24	
5	Feb. 9	30 days		Feb. 11	
6	Apr. 27	4 months		May 14	
7	July 12	3 months		July 27	
8	Aug. 8	2 months		Aug. 15	
9	Jan. 14	90 days		Feb. 2	
10	Apr. 5	60 days		Apr. 12	

To find the bank discount and the net proceeds.—

Example.—Find the bank discount at 6% and the proceeds of a 90-day note for $1800, dated April 1 and discounted May 5.

April 1 + 90 days = June 30, the date of maturity
From May 5 to June 30 = 56 days, the term of discount
$18.00 = the discount for 60 days
$ 9.00 = the discount for 30 days
6.00 = the discount for 20 days
1.80 = the discount for 6 days
$16.80 = the discount for 56 days
$1800 − $16.80 = $1783.20, the net proceeds

Problems

Find the bank discount on the following, using current year and bankers' time:

	Face	*Date*	*Time*	*Date of Dis.*	*Rate of Dis.*
1	$1200	Jan. 2	4 months	Jan. 15	6%
2	2500	Apr. 1	3 months	May 1	6%
3	1750	June 10	90 days	June 25	6%
4	3000	May 15	60 days	May 18	6%
5	650	July 5	5 months	Aug. 10	6%
6	5000	Mar. 1	6 months	May 1	5%
7	1500	Aug. 7	4 months	Aug. 15	7%
8	3500	Sept. 6	90 days	Sept. 11	6%
9	4500	Feb. 1	60 days	Feb. 5	6%
10	6000	July 1	30 days	July 6	6%

Example.—Find the bank discount at 6% and the net proceeds of a 60-day draft for $2500, accepted Apr. 10 and discounted Apr. 12; collection, $\frac{1}{6}$%.

Apr. 10 + 60 days = June 9, the date of maturity
From Apr. 12 to June 9 = 58 days, the term of discount
$25.00 = the discount for 60 days
.83 = the discount for 2 days
$25 − $.83 = $24.17, the discount for 58 days
$\frac{1}{6}$% × $2500 = $5, the collection charge
$24.17 + $5 = $29.17, the bank's total charge
$2500 − $29.17 = $2470.83, the net proceeds

Problems

1. Find the net proceeds of a 90-day draft for $3000, accepted June 5, and discounted June 15, at 6%; collection, $\frac{1}{4}$%.

2. Find the net proceeds of a 60-day draft for $2460, accepted May 4, and discounted May 12, at 6%; collection, $\frac{1}{6}$%.

3. Find the net proceeds of a 4-months' trade acceptance for $2820, accepted Jan. 10, and discounted Jan. 10, at 6%; collection, $\frac{1}{10}$%.

4. Find the net proceeds of a 30-day draft for $12,000, accepted Apr. 17, and discounted Apr. 23, at 5%; collection, $\frac{1}{8}$%.

5. Find the net proceeds of a 90-day draft for $3360, accepted Feb. 16 and discounted Feb. 25, at 6%; collection, $\frac{1}{10}$%.

$750 00/100 Denver, Col, Jan. 15, 192—

Four months — AFTER DATE I PROMISE TO PAY

TO THE ORDER OF Frank W. Lamont

Seven hundred fifty and 00/100 — DOLLARS

AT The Merchants National Bank of Denver

VALUE RECEIVED with interest at 6%

DUE May 15 19— Homer L. Johnson

Form 7.

Example.—Find the proceeds of the above note, if it was discounted at the Merchants Bank on Feb. 1, at 6%.

(Mr. Lamont would have to endorse this note before the Merchants Bank would accept it for discount.)

$ 7.50 = the int. for 2 mo. (60 days) at 6%
$15.00 = the int. for 4 mo. at 6%
$750 + $15 = $765, the amount of maturity
From Feb. 1 to May 15 = 72 days, the term of discount
$7.65 = the discount for 60 days at 6%
1.53 = the discount for 12 days at 6%
$9.18 = the discount for 72 days at 6%
$765 − $9.18 = $755.82, the net proceeds

To find the proceeds of interest-bearing paper.—

1. *Find the date of maturity.*
2. *Find the interest at the given rate for the full time.*
3. *Add the interest and the face of the note to find the amount.*
4. *Find the discount, at the given rate of discount, on the amount for the term of discount (the difference between the date of discount and the date of maturity).*
5. *Subtract the discount from the amount to find the proceeds.*

Problems

Find the proceeds of the following:

	Face	*Date*	*Time*	*Rate of Int.*	*Date of Dis.*	*Rate of Dis.*
1	$ 900	Jan. 4	4 months	6%	Feb. 1	6%
2	1350	Mar. 6	3 months	5%	Apr. 1	6%
3	2750	June 1	90 days	6%	June 15	6%
4	4500	July 2	60 days	5%	July 12	6%
5	6000	Aug. 10	2 months	4%	Aug. 15	6%
6	850	May 7	90 days	6%	May 12	6%
7	1750	Apr. 14	60 days	6%	Apr. 20	6%
8	9000	Feb. 1	4 months	6%	Feb. 15	5%
9	2650	Sept. 8	3 months	6%	Sept. 15	6%
10	3500	Oct. 5	60 days	6%	Oct. 10	6%

PRESENT WORTH AND TRUE DISCOUNT

The **present worth** of a debt is a sum which, if put at interest at a given rate for a given time, will equal the amount of the debt at maturity.

The **future worth** of a debt is its value at maturity, or the amount due at maturity.

The **true discount** is the difference between the present worth and the future worth of a debt. It is equal to the interest on the present worth of the debt for the time it has yet to run before maturity.

In order to find the true discount, it is necessary to find the present worth.

To find the present worth and true discount.—

Example.—Find the present worth and true discount of a debt for $1580 due in 5 mo., if money is worth 6% interest.

$1 for 5 mo. at 6% = $1.02½
$1580 ÷ $1.02½ = $1541.46, the present worth
$1580 − $1541.46 = $38.54, the true discount

Proof.—

$1541.46 for 5 mo. at 6% = $38.54, the interest
$1541.46 + $38.54 = $1580, the amount at maturity

Problems

Find the present worth and true discount:

	Debt	*Time*	*Rate*		*Debt*	*Time*	*Rate*
1.	$1500	4 mo.	6%	**6.**	$2540	90 days	6%
2.	$ 690	3 mo.	6%	**7.**	$4200	6 mo.	4%
3.	$2750	6 mo.	5%	**8.**	$7500	3 mo.	5%
4.	$3200	5 mo.	6%	**9.**	$ 380	90 days	6%
5.	$ 275	8 mo.	6%	**10.**	$ 960	7 mo.	6%

General Problems

1. Find the difference between the simple interest and the true discount on a debt for $2800, due in 5 mo., at 6%.

2. A dealer sold an article for $42.60 on 3 months' credit. If money is worth 6% interest, at what cash price could he afford to sell this article?

3. A merchant bought an invoice of goods amounting to $1580.80 on 4 months' credit or 5% discount for cash. He discounted his note at 6% for 4 mo. for such an amount that the proceeds were equal to the net amount of the invoice. (a) For what amount did he make this note.[2] (b) How much did he gain by discounting his note and paying cash?

[2] To find the face of the note, divide the net amount of the invoice by 98 ($1 − 2¢ dis.), the net amount of a note for $1.00.

4. For what amount must a merchant give his 90-day note so that, when he has it discounted at 6% at the bank, the proceeds will just pay the net amount of an invoice amounting to $1642.40; terms 4/10, n/90?

5. A dealer offered radios at $250 on 4 months' credit or $242.50 cash. If money is worth 6% interest, how much better for the purchaser is the cash offer than the time offer? (Find the difference between $250 and the amount of $242.50 at 6% for 4 mo.)

6. A wholesale dealer offered 4 months' credit on an invoice of goods amounting to $2428.50. The purchaser settled for this invoice by giving his note for 4 mo. at 6% interest, for an amount which at maturity will just equal the amount of the invoice. Find the amount of the note. Prove your work.

7. A man was offered a used automobile for $800 cash or $850 on 6 months' credit. (a) The difference between the time price and the cash price is equal to what rate of interest on the cash price? (b) If money is worth 6% interest, how much would the purchaser make by borrowing the money and paying cash?

8. A man is paying $1200 a year rent for a house. He can buy the house for $9000. If the interest rate is 6%, and the carrying charges for taxes, insurance, and upkeep amount to $495, which is the better, to rent the house or to buy it, and how much better?

9. Find the difference between the exact interest and the ordinary interest on \$15,000 for 168 days at 6%.

10. A dealer offers a certain piano for \$480 cash or \$500 on 6 months' credit. If money is worth 6%, how much does he allow for financing this transaction and to cover possible loss from bad debts?

11. A merchant bought 200 bbl. of flour for \$8.75 a barrel. He had his 4 months' (122 days, calendar time) note discounted at 6% for such an amount that the proceeds just equaled the cost of the flour. He then paid cash for it. He sold the flour within four months for \$10.50 a barrel. How much did he gain?

12. The rent of a store building and lot is \$4800 a year. The carrying charges are as follows: taxes, \$1200; insurance, \$100; heating, \$500; average upkeep, \$600. If money is worth 6%, how much could the tenant afford to pay for this property?

13. A house and lot were purchased for \$12,500. There is a \$7000 mortgage on the property at 6%. The taxes, upkeep, and other expenses amount, on an average, to about \$580 a year. For how much a month will this house have to be rented to give the owner 8% interest on his equity[3]?

[3] Equity is the difference between the purchase price, or the value of the property, and the amount of the mortgage. (In this case, \$12,500 − \$7000 = \$5500 = the equity.)

14. A merchant bought an invoice of goods amounting to \$1248.60 on the following terms: 5/10, n/90. He paid cash within 10 days. The discount that he received is equal to what rate of interest for 90 days on the net amount of the invoice?

15. A man bought a building lot for \$1800. He paid \$300 cash and \$250 every 6 months, plus the interest at 6% each time on the unpaid balance. How much did the lot cost him?

PARTIAL PAYMENTS

Partial payments are payments in which a part of the indebtedness is paid at a time on a note or other obligation.

\$4000 00/100 Detroit, Mich. Jan 16, 19—

Six months after date I promise to pay to the order of Andrew D. Martin

Four thousand and 00/100 Dollars

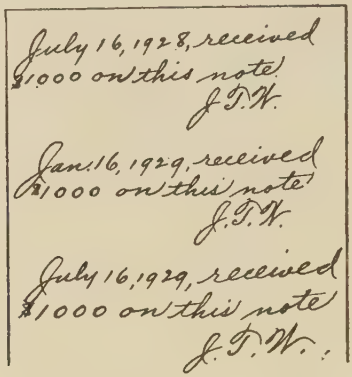
at The First National Bank of Detroit.

Value received with interest at 6%.

No 42 Due July 16, 19— John T. White

Form 8.

The note on p. 179 was given for 6 months and should normally have been paid in full when due. Instead, substantial payments were made every 6 months, and were endorsed on the back of the note, as follows:



Form 9.

To find the amount payable at date of settlement when partial payments have been made.—

Example.—The above note was settled in full on January 15, 1930. How much was payable at this time?

$4000 for 6 mo. at 6%	= $120, the interest
$4000 + $120	= $4120, the amount
$4120 − $1000, the payment,	= $3120, the new principal
$3120 for 6 mo. at 6%	= $93.60, the interest
$3120 + $93.60	= $3213.60, the amount
$3213.60 − $1000, the payment	= $2213.60, the new principal
$2213.60 for 6 mo. at 6%	= $66.41, the interest
$2213.60 + $66.41	= $2280.01, the amount
$2280.01 − $1000, the payment	= $1280.01, the new principal
$1280.01 for 6 mo. at 6%	= $38.40, the interest
$1280.01 + $38.40	= $1318.41, the amount payable on Jan. 16, 1930

In partial payment problems, the payment periods are found by compound subtraction unless they are easily determined otherwise, as is the case in the preceding problem.

The United States Rule

To solve partial payment problems by the United States Rule.—

1. *Find the interest on the principal at the given rate up to the time the first payment is made.*

2. *If this payment is greater than the interest then due, add the interest to the principal and from this sum subtract the payment, and continue with other payments in the same way.*

3. *In case the interest for any period is greater than the payment for that period, add this payment with the next payment or add the payments together until their sum is equal to or greater than the interest for the combined periods. Then, from this amount, subtract the sum of the payments.*

This is in accordance with a ruling of the Supreme Court of the United States, so that compound interest will not be charged. It is called the United States Rule for Partial Payments.

Banks accept partial payments of notes which they have accepted for discount from their customers, but, as a rule, they require that the old note be canceled and that a new note for the amount unpaid be discounted. By this method they are able to collect compound interest and at the same time avoid the Supreme Court ruling, because they collect the interest in advance.

Under the Statute of Limitation, notes and accounts on which no payments have been made remain in full force for a period, usually six years from the due date, during which time court action to recover may be taken by the creditor.

Mortgages are made for a definite time, but very often they are allowed to run on indefinitely, so long as the interest payments are made when due. In this case, banks holding mortgages are, as a rule, willing to accept partial payment on any interest date.

Problems

1. J. W. Harper holds a 3-months' note for $1500, dated July 2, 1928, with interest at 6%, on which the following payments have been endorsed: Oct. 2, 1928, $500; Jan. 2, 1929, $500. How much would be required to settle this note on April 2, 1929?

2. A note for $950, dated Apr. 17, 1928, with interest at 6%, had the following payments endorsed upon it: Oct. 17, 1928, $300; Apr. 17, 1929, $400. How much was payable on June 17, 1929?

3. A note for $2500, dated June 4, 1928, at 6%, had payments endorsed upon it as follows: Sept. 4, 1928, $750; Jan. 4, 1929, $750; May 4, 1929, $750. What amount would be required to settle this note on Sept. 4, 1929?

Example.—A demand note for $5000, dated Jan. 2, 1928, with interest at 6%, had payments endorsed upon it as follows: Mar. 10, 1928, $1000; July 5, 1928, $50; Jan. 2, 1929, $2500; May 1, 1929, $500. How much would settle this note on July 1, 1929?

Find the time by compound subtraction.

$5000 for 2 mo., 8 days at 6% = $56.67, the interest
$5000 + $56.67 = $5056.67, the amount
$5056.67 − $1000 = $4056.67, the new principal

The next payment is less than the interest. Therefore, the interest will have to be found for two interest periods, and the sum of the two payments subtracted from the amount.

$4056.67 for 7 mo. 22 days at 6% = $155.86, the interest
$4456.67 + $155.86 = $4512.53, the amount
$4512.53 − $2550 ($50 + $2500) = $1962.53, the new principal
$1962.53 for 3 mo. 29 days at 6% = $38.92, the interest
$1962.53 + $38.92 = $2001.45, the amount
$2001.45 − $500 = $1501.45, the new principal
$1501.45 for 2 mo. at 6% = $15.01
$1501.45 + $15.01 = $1516.46, the amount due on July 1, 1929

Problems

1. A note for $2000, dated June 4, 1928, at 6% interest, has endorsed upon it the following payments: Aug. 1, 1928, $400; Dec. 5, 1928, $650; Mar. 6, 1929, $500. What was the amount due June 4, 1929?

2. A note for $1250, dated Jan. 7, 1929, at 6% interest, has the following payments endorsed upon it: Apr. 2, 1929, $450; July 11, 1929, $400. How much will settle this note on Oct. 5, 1929?

3. On Sept. 3, 1928, W. D. Barber gave a note for $2500 at 6% interest. He made payments as follows: Jan. 3, 1929, $500; April 3, 1929, $800; June 18, 1929, $650. How much would he have to pay to settle this note in full on Sept. 3, 1929?

4. On June 7, 1928, A. H. Long received a note for $1750, at 6%, on which the maker paid as follows: Aug. 1, 1928, $500; Nov. 5, 1928, $700; Apr. 8, 1929, $300. How much would be required to settle the note in full on June 3, 1929?

5. A note for $6000, dated July 2, 1928, at 6%, has payments endorsed upon it as follows: Sept. 6, 1928, $1000; Jan. 2, 1929, $75; April 1, 1929, $2500; July 1, 1929, $2000. How much remained unpaid on Oct. 1, 1929?

The Merchants' Rule

To solve partial payment problems by the Merchants' Rule.—

1. *Find the interest on the face of the note from its date to the time of settlement.*

2. *Find the interest on each payment from its date to the date of settlement.*

3. *From the face of the note, plus the interest thereon, subtract the sum of the payments and the interest thereon. The difference will be the amount then due.*

Example.—On a note for $1600, dated May 1, 1928 and due May 1, 1929, at 6% interest, the following payments were endorsed: Aug. 2, 1928, $600; Dec. 3. 1928, $500. Find the balance due May 1, 1929.

$1600 for 1 yr. at 6% = $96, the interest
$1600 + $96 = $1696, the amount at maturity
$600 for 8 mo. 29 days (Aug. 2, 1928, to May 1, 1929) at 6% = $26.90, the int. on first payment
$500 for 4 mo. 28 days (Dec. 3, 1928, to May 1, 1929) at 6% = $12.33, the int. on second payment
$1696 − $1139.23 ($600 + $26.90 + $500 + $12.33) = $556.77, the balance due at maturity

Problems

Solve by the Merchants' Rule:

1. On a note for $1200 given for 9 mo. after Jan. 2, 1928, at 6%, the following payments are endorsed: Apr. 2, 1928, $400; July 2, 1928, $500. How much remained unpaid at maturity?

2. H. E. Stanley gave his note for $1800, dated Apr. 3, 1928, for 1 yr., at 6%, to J. D. Finch. Stanley made payments on this note as follows: June 3, 1928, $500; Aug. 6, 1928, $600; Dec. 3, 1928, $400. How much did Stanley have to pay at maturity?

3. A. H. Havens holds a note for $2500, dated June 12, 1928, for 1 year, at 6%, on which the following payments are endorsed: Sept. 12, 1928, $800; Jan. 2, 1929, $700; Apr. 12, 1929, $600. How much should Havens collect from the maker at maturity?

Solve the following both by the United States Rule and by the Merchants' Rule.

4.

\$3000 *Boston, Mass., July 2, 1928*

One year after date *we* jointly and severally promise to pay to the order of *John M. Raymond*

Three thousand and $\frac{no}{100}$ Dollars

at *The First National Bank of Boston*

Value received *with interest at 6%*

Due *July 2, 1929*

B. M. Hanson
H. R. Green

The following payments were endorsed on the above note: Oct. 2, 1928, \$1200; Feb. 2, 1929, \$700; May 2, 1929, \$500. How much was due at maturity? (The exact time may be used in finding the interest in partial payment problems, if the parties agree to it. It should be remembered that the "United States Rule" is the legalized rule.)

TAXES

A **tax** is a sum charged against certain individuals and against property owned by individuals or private organizations for the purpose of raising money to defray the expenses of government or of operating public institutions.

The two kinds of taxes are: **direct** and **indirect.**

Direct taxes are charged against individuals and against property.

In some states, voters have to pay a **poll tax.** This is a direct tax against individuals.

A person may be taxed for the privilege of doing a certain thing or conducting a certain business. This is a direct tax in the form of a **license fee,** or **franchise tax.**

The most common form of direct tax is the **property tax,** which results from assessing privately owned property, real and personal, at a certain value. Against this amount the tax to be raised is charged, according to the tax rate.

The **tax rate** is the result obtained by dividing the amount of tax to be raised in a certain district by the assessed valuation of the taxable property in that district

Assessors are officers elected or appointed to make up the assessment roll for a certain district.

The **assessment roll** contains the names of individuals and the listings of all property to be taxed.

Indirect taxes are in the form of duties on imported goods and excise tax, or internal revenue, which is a charge at the source on the manufacture of certain articles, such as cigars, cigarettes, playing cards, and distilled spirits.

The purchaser of articles on which an indirect tax has been laid pays this tax ultimately by paying more for the article than he otherwise would have to.

In order to determine the amount of tax to be raised, it is the general practice now for each division or department of government, whether town, city, county, state or nation, to prepare a budget in which are listed the estimated expenses of the particular department for the coming tax year. In some places the tax year extends from Jan. 1, to Dec. 31; in other places, from May 1, to April 30, and there are various other systems of dividing the year.

A specimen tax budget.—

The following is a tax budget for a certain city for the tax year Jan. 1 to Dec. 31, 19—, as presented by the different departments. (The items are given for one department, and only the totals are given for the other departments.)

Department of General Government

City Council	$ 16,800.00
Board of Estimate and Contract	300.00
City Clerk	23,100.00
City Court	23,400.00
City Planning Board	5,500.00
Recreation Commission	28,000.00
Civil Service Commission	4,900.00
Department of Assessments and Taxation	13,750.00
Department of Finance	39,900.00
Department of Law	29,900.00
Department of Public Works:	
Office	18,450.00
Engineering	26,275.00
Elections	18,800.00
Mayor	15,050.00
Mayors' Conference	500.00
Board of Zoning Appeals	2,600.00
Municipal Buildings and Grounds	27,451.62
Purchasing Agent	6,350.00
Total	$301,026.62

The budget totals for other departments were:

Department of Public Safety (Police, fire, buildings, and charities)	$ 537,071.25
Conservation of Health	34,700.00
Sanitation and Cleanliness	199,850.00
Highways	296,540.00
Recreation	8,850.00
Publicity	500.00
Miscellaneous	26,150.00
Debt Service	878,861.10
State Taxes	101,093.72
County Taxes	636,983.58
Total City, State and County Tax	3,021,626.27
Deductions from Income and other Sources	451,248.86
Net City Budget	2,570,377.41
Net School Budget	1,651,513.08
Total Budget	$4,221,890.49

In this particular city the tax rate for this tax year is $2.80 for each $100 of assessed valuation of the taxable property.

To find the tax due on a property when the assessed valuation and the tax rate are given.—

Example.—Find the tax to be paid on property assessed for $8750, if the rate is $1.775 per $100.

$1.775 per $100 = $1.77\frac{1}{2}\% = .01775$

$8750 \times .01775 = \$155.3125$ or $155.31, the tax

or $\$87.50 \times \$1.775 = \$155.3125$ or $155.31

Problems

1. The assessed valuation of a piece of property is $14,800, and the rate is $2.12 per $100. Find the tax to be paid.

2. Find the tax on property assessed for $3950, if the tax rate is $1\frac{7}{8}\%$.

3. Find the tax on two pieces of property assessed for $2300 and $5100, if the tax rate is $1.93 per $100.

4. Find the total tax on a piece of property assessed for $21,500, if the city tax rate is .0128, the county and state tax rate is .0054 and the school tax rate is .0063, per $1 of assessed valuation.

5. The tax rate in a certain city was $21.473 per $1000. Find the tax in this city on property assessed for $12,750.

To find the tax due when assessed valuation, tax rate, and collector's fee are given.—

Example.—Find how much a man paid, whose property was assessed for \$7800, if the tax rate was \$2.134 per \$100, and the collector charged 2% for collecting.

\$ 2.134 × 78 (78 hundred) = \$166.45, the tax
\$166.45 × .02 (2%) = \$3.33, the collector's fee
\$166.45 + \$3.33 = \$169.78, the amount paid

Problems

1. Find the total tax to be paid on property assessed for \$17,700, if the tax rate is \$1.885 per \$100, and the collector's fee is $1\frac{1}{2}$%.

2. A certain man's property is assessed for \$12,000. How much tax will he have to pay if the village, county, and state tax rate is \$1.425 per \$100, the school tax rate is \$.873 per \$100, and the collector's fee is 1%?

3. In a certain village the assessed valuation of the taxable property is \$897,460, and the tax rate is \$1.742 per \$100. (a) How much tax does the village have to raise? (b) How much does the collector get, if his fee is $1\frac{1}{2}$%?

4. In a certain township the taxable property is assessed at \$4,248,300 and the rate is \$7.625 per \$1000. In this county there are 7,000 voters who pay a poll tax of \$2 each. Find the total tax raised.

5. In a certain city the assessment roll shows the valuation of taxable property to be \$324,864,920. The city tax rate is \$14.543 per \$1000 and the school tax rate is \$9.652 per \$1000. (a) Find the tax to be raised for each purpose. (b) Find the total tax to be raised.

To find the tax rate when the total assessment and the tax budget are given.—

Example.—The assessed valuation of the taxable property in a certain village is \$34,481,540 and the tax to be raised amounts to \$815,142.81. Find (a) the tax rate, in a per cent; (b) the rate on each \$100 valuation; (c) the rate on each \$1000 of valuation.

\$815,142.81 ÷ \$34,481,540 = .02364, or 2.364%
2.364% = \$ 2.364 per \$100
2.364% = \$23.64 per \$1000

Problems

1. The assessment roll shows the valuation of taxable property in a certain city to be $41,483,370 and the tax roll shows taxes to be collected amounting to $1,041,232.59. Find the tax rate per $100 of assessed valuation.

2. The county and state tax for a county amounts to $1,344,913.64 and the assessment roll shows the total valuation of taxable property to be $312,770,614. Find the tax rate per $1000 of assessed valuation.

3. A city assessment roll totals $586,710,312 and the tax roll totals $12,526,265.16. (a) Find the tax rate per $100 of assessed valuation. (b) How much tax would the owner of a property assessed at $11,500 have to pay?

4. A city tax budget calls for $4,221,890.49 and the assessment roll amounts to $1,507,818,032.18. (a) Find rate of tax per $100. (b) How much tax would the owner of property assessed at $21,800 have to pay?

To find the total assessment when the tax budget and the tax rate are given.—

Example.—A certain tax roll shows a total of $18,837,091.28, and the tax rate is $2.13 per $100. Find the total of the assessment roll.

$2.13 per 100% = 2.13%, or .0213
$18,837,091.28 ÷ .0213 = $884,370,482.40, total assessment roll

Problems

1. The tax roll for a certain city totals $40,539,580.40, and the tax rate is $2.20 per $100. Find the total of the assessment roll.

2. A village budget contains the following items: administration department, $12,200; police department, $8500; streets and sidewalks, $11,300; county and state taxes, $5240; schools, $17,900; miscellaneous, $2000. The tax rate is $1.25 per $100. For how much was the taxable property in the village assessed?

3. A certain taxpayer paid taxes amounting to $526.40. If the tax rate was $2.80 per $100, for how much was his property assessed?

4. The state and county tax for a certain city amounts to $738,077.50 and the rate per $100 is $.415. Find the assessed valuation of the property taxed.

INCOME TAX

The national Government and many of the states impose a tax upon incomes which are in excess of certain amounts, in the case of individuals living within the United States, whether citizens or not, and of all corporations doing business within the United States.

Individuals and corporations coming under the provisions of the law must file an **income tax return,** for the preceding year, on March 15 of each year with the Collector of Internal Revenue for the United States, and with the State Tax Bureau in states having an income tax law.

Total income includes earnings, interest received, income from business or profession, rent income, royalties, profits from investments, dividends, and other sources of gain.

Total deductions include taxes; interest paid; losses resulting from bad debts, fire, storm, and various other sources; donations to charities; provision for dependents, as well as other expenditures authorized by law.

Net income is the difference between the total income and the allowable deductions.

The Federal income tax on incomes of individuals is classified as **normal tax** and **surtax.**

Normal tax is the regular income tax on all incomes in excess of the allowable exemptions.

Surtax is an extra tax on large incomes, in addition to the normal tax.

Taxable income is the amount of income after all allowable exemptions have been deducted.

These tax laws, like other laws, are revised from time to time. The latest complete information should, therefore, be secured from the tax departments, both State and Federal.

Federal Income Taxes

Under the Federal law,[1] the normal tax rates for 1929 were as follows:

½% of the first $7500 of taxable income
2% on the next $4000 ($7500 to $11,500)
4% on all over $11,500

The surtax rate in 1929 was as follows:

1% on taxable incomes in excess of $10,000 up to $14,000
2% on the next $2000 ($14,000 to $16,000)

[1] Federal income tax rates may be changed at any time by an Act of Congress, signed by the President. Various tax services provide information as to present rates and changes in income tax schedules.

3% on the next $2000 ($16,000 to $18,000)
4% on the next $2000 ($18,000 to $20,000)
5% on the next $2000 ($20,000 to $22,000)
6% on the next $2000 ($22,000 to $24,000)
7% on the next $4000 ($24,000 to $28,000)
8% on the next $4000 ($28,000 to $32,000)
9% on the next $4000 ($32,000 to $36,000)
1% increase on each $4000 increase in income up to and including $64,000
17% on the next $6000 ($64,000 to $70,000)
18% on the next $10,000 ($70,000 to $80,000)
19% on the next $20,000 (80,000 to $100,000)
20% on all over $100,000

Individual incomes are classed as **earned** and **unearned.**

Earned incomes come from salaries, wages, commissions, charges for services rendered, and the like.

Unearned incomes come from dividends, interest, rents, profit on investments, and the like.

Individual incomes up to $30,000 may be considered as earned, and taxed at lower rates.

Married persons are exempt $3500, and $400 additional for each legal dependent.

Single persons are exempt $1500.

Corporations are taxed 11% on net taxable incomes for 1929.

To find the amount of a person's Federal income tax.—

Example.—A married man, with two children under 18 years, has a net income of $7800. Included in his net income is $83.60 interest on tax exempt bonds. Find his Federal income tax for 1929.

$7800	= his total net income
−83.60	= tax exempt income deducted
$7716.40	= his net taxable income
−$3500.	= personal exemption deducted
$4216.40	= the remainder
−$800.00	= exemption for dependents deducted
$3416.40	= his taxable income
.005	= rate of tax
$ 17.08	= his income tax

Problems

1. A married man, with one child under 18, has a net income from his profession of $12,937.50. His income exemptions, other than for his child, amount to $430 Find his Federal income tax.

2. A single person with no dependents has a net income for the year of $3860. He paid interest on personal indebtedness of $60 and lost $250 through bad debts. Find his Federal income tax.

3. A married man's income for the year was as follows: salary and commissions, $18,840; rent income, $780, dividends, $550. He paid property taxes amounting to $312; interest, $180; and his other allowable deductions amount to $428.60. If he has three legal dependents, how much was his Federal income tax?

4. A single man's income was as follows: earnings, $24,000; dividends, $12,500; profits from sales of real property, $15,000; rent, $8000. He lost $1800 by a fire; paid $1730 property tax; the interest on personal indebtedness amounted to $900; and he gave $500 to charities. Find his Federal income tax. (He was allowed a credit deduction of 25% of the tax on his net earned income up to $30,000.)

5. A married man's net income was $9600. His wife's net income was $2800. They have two children under 18 years of age. The husband's authorized deductions amount to $580, and the wife's to $135. They made a combined Federal income tax return. How much tax did they have to pay? (It is usual for a man and wife who have independent incomes to make a combined return. In case they make separate returns, the exemptions other than personal ones can be claimed by only one of them; except in a case such as this, where each might claim an exemption for one dependent.)

State Income Taxes

State income tax rates vary in the different states.

In New York State, which is typical, the rates in 1929 were as follows:

1% on the first $10,000;
2% on the next $40,000;
3% on amounts over $50,000.

The personal exemptions were:

For a married person who is head of a family, $4000, plus $400 for each legal dependent;

For a single person, or a married person not living with husband or wife, and not the head of a family, $2500 and $400 for each legal dependent.

For further study, secure a copy of the Income Tax Law of your own state.

To find the amount of a person's state income tax.—

The method is the same as that used to find the Federal income tax.

Problems

1. A single man's net income was $4800. He paid $240 in taxes and contributed $300 to church and charities. Find his income tax for your state or for New York State. (Under the New York State Law, contributions for religious and benevolent purposes must not exceed 15% of net income.)

2. A married man's income was as follows: from his business, $12,925; from royalties on a patent, $15,370; from dividends, $840; profits from the sale of stock, $2320. His allowable deductions are: for bad debts, $352; for taxes, $512.80; for contributions, $150. He has two children under 18 years of age. Find his income tax for your state or for New York State.

Corporation Income Tax

Corporations are required to pay an income tax which is a certain percentage of their net earnings. The Federal tax rate[2] in 1929 on corporations was 11% of the net earnings. Many states also levy a state income tax on the earnings of corporations operating within the state.

To find the amount of a corporation's income tax.—

The method is the same as that outlined for individual taxes.

Problems

1. A corporation's net taxable income amounted to $312,480. If the Federal tax rate is 12%, how much income tax would this corporation have to pay?

2. A corporation paid an income tax of $36,642.04. If the rate was 12%, what was the amount of its taxable income?

Estate Taxes

Taxes are also laid on estates at the time of inheritance.

[2] These rates may be changed at any time by an act of Congress, signed by the President. For latest data, see the most recent Federal tax regulations.

The Federal estate tax rates[2] in 1929 were as follows:

The first $100,000, exempt;
The next $50,000, 1%;
The next $50,000, 2%;
The next $100,000, 3%;
The next $200,000, 4%;
The next $200,000, 5%, etc., up to 7%;
The next $500,000, 8%, etc., up to 13%;
The next $1,000,000, 14%, etc., up to 19%;
On $10,000,000 or more, 20%.

To find the amount of Federal tax due on an inherited estate.—

The method is the same as that for finding individual income taxes.

Problems

1. An estate was appraised at $7,428,250. After all allowable deductions had been made, the amount subject to the Federal estate tax was $5,912,300. Find the amount of tax paid.

2. Find the Federal estate tax on an estate appraised at $2,526,500 after deducting the following allowances: Funeral expenses, $6142.50; cost of administration, $15,800; for bad debts, $9,350; state inheritance tax, $4820.25. The appraised estate includes a life insurance policy of $20,000, in which the wife is named as the beneficiary, which is also exempt.

State Estate Taxes

Many states have inheritance tax laws, which in effect are about the same as the Federal law. The state tax is payable in addition to the Federal tax. In case it is desirable to study this phase of estate taxes, consult the tax schedules of your own state.

UNITED STATES DUTIES

Duties, or **customs,** are taxes levied by the Federal Government upon commodities imported or exported.

[2] These rates may be changed at any time by an act of Congress, signed by the President. For latest data, see the most recent Federal tax regulations.

The two kinds of duties are **ad valorem** and **specific.** A duty may be either ad valorem or specific. Both kinds are levied upon certain articles.

Ad valorem duty, as the term implies, means "according to the value." It is a certain per cent of the value. The values are determined by the invoice prices in the country from which the articles are imported, or by appraisal by the custom house officials of the United States.

Specific duty is a stated amount levied on certain articles, according to quantity as weighed or measured, *i.e.*, so much per pound, bushel, yard, or other measure. (A specific duty "per ton" means per long ton of 2240 pounds.)

A **tariff** is a schedule of the duties on the different articles.

Tare is a deduction made for the weight of the box, crate, or packing material. Allowance is made also for leakage and for breakage.

The two forms of entry for goods received are **consumptive entry** and **warehouse entry.**

A consumptive entry is made for all articles on which the duty is paid at once.

A warehouse entry is made for all articles on which the duty is not paid at once, and which are put in bonded warehouses.

A bonded warehouse is used for the storage of articles on which the duty has not been paid. The owner of such a warehouse is required to give a bond to the government that he will not permit the delivery of stored articles until the duty has been paid, unless the articles are subject to other regulations.

The importer also gives a bond whereby he is obligated to pay the duty and remove the articles within three years. Articles not removed within the three years may be sold to pay the duty and the storage.

Schedule of Tariff Rates

The following schedule gives the rates upon a few articles according to the Tariff Act of 1922:

Articles	*Ad Valorem*	*Specific*
Barley		20¢ a bushel
Bicycles	30%	
Cheese		5¢ a pound
Corn		15¢
Cotton cloth	10¼ to 45%	
Cotton table damask	30%	
Cotton hose and half hose	30 to 50%	
Diamonds and other precious stones	10%	
Eggs		8¢ a dozen
Honey		3¢ a pound
Lard		1¢ a pound
Nails exceeding 2″ in length		4 to 10¢ a pound
Oriental carpets and rugs	55%	
Pig Iron		$1.12½ a ton
Poultry, live		5¢ a pound
Printing paper	10%	¼¢ a pound
Screws	25%	
Shears and scissors	45%	3½ to 20¢ each
Wheat		30¢ a bushel
Wool blankets	30 to 40%	18 to 37¢ a pound
Wool hose and half hose	35 to 50%	36 to 45¢ a pound
Wool gloves and mittens	35 to 50%	36 to 45¢ a pound
Wool knit underwear	30 to 50%	36 to 45¢ a pound

Use this table in solving the following problems. When two rates are given for the same duty, use the lowest rate, unless rates are given in the problem.

To find the duty when invoice price and rate are given.—

Example.—Find the duty on a case of wool hose invoiced at £80, 4s. ($390.17) and weighing 112 pounds net, and a case of wool blankets valued at £129, 10s. ($630.02) and weighing 223 pounds net.

$390.17 × .35 (35%) = $136.55, the ad valorem duty on hose
112 pounds × 36¢ = $ 40.32, the specific duty on hose
$630.02 × .30 (30%) = $189.01, the ad valorem duty on blankets
223 pounds × 18¢ = $ 40.14, the specific duty on blankets
Adding: = $406.02, the total duty

Problems

1. Find the duty on 1250 pounds of cheese and 600 doz. eggs.

2. Find the duty on 448,000 pounds of pig iron.

3. Find the duty on a consignment of oriental rugs invoiced at $28,400.

4. Find the total duty on 100 gross of screws invoiced at 24 francs (94.02¢) a gross, and 3 gross of scissors invoiced at 10 francs (39.175¢) per pair. (Exchange, 3.91¾¢ per franc.)

5. Find the total duty on one case of wool knit underwear weighing 280 pounds and invoiced at £70, 10s. (Exchange, $4.864 per £.)

Invoices of imported articles are generally made out in the currency of the countries from which they are sent.

Example.—Find the duty on 15 gross of cotton damask tablecloths invoiced at 8s., 3d. each. (Exchange, $4.864 per £.)

144 (1 gross) × 15 = 2160, the number of pieces
8s., 3d. = $2.0064, the cost of one piece
2160 × $2.0064 = $4333.824, the invoice price
$4333.824 × .30 (30%) = $1300.15, the duty

Problems

1. Find the duty on 4 dozen bicycles invoiced at 800 francs each. (Exchange, 3.91¾¢ per franc.)

2. Find the duty on 50 gross pairs of wool hose invoiced at 1s., 6d. a pair (exchange, $4.68 per £) and weighing 1800 pounds. The ad valorem duty is 50% and the specific duty is 45¢ a pound (see table).

3. Find the duty on 20 gross suits of wool knit underwear invoiced at 8s. each (exchange, $4.866 per £) and weighing 2544 pounds. The duties are 40%, and 40¢ a pound.

4. Find the duty on 12 gross pairs of wool gloves, invoiced at 3s., 6d. a pair and 8 gross pairs of wool mittens invoiced at 2s. a pair. The whole consignment weighed 575 pounds, and exchange was $4.864 per £. (Do not drop decimals, which will change results.)

5. Find (a) the duty and (b) the total cost of 12,000 yards of cotton cloth invoiced at 1s., 2d. a yard; exchange, $4.86 per £; duty, 25%, and freight, $30.

General Problems

1. A New York merchant bought goods in Germany invoiced at 1865 marks. The duty was 35%, and the mark was worth 23.86¢. How much in U. S. money did the goods cost him in New York, if the freight was 112 marks?

2. An importer purchased in England 30,000 pounds of print paper invoiced at 10s. per 100 pounds. The freight to Philadelphia was £18, 10s.; exchange, $4.8665. How much a pound in U. S. money did the paper cost when delivered in Philadelphia? (See table for duties.)

3. A Boston merchant bought an invoice of 30 gross pairs of wool half hose at 2s. a pair. The weight was 2100 pounds and the freight to Boston was £6, 4s. The duty was 40% and 40¢ a pound. If exchange was $4.8665, for how much a pair will they have to be sold to make a profit of 40% on the cost?

4. A farm bureau imported 500 bu. of seed wheat and 300 bu. of seed barley from Denmark. The wheat was invoiced at 8 kroner per bushel of 60 pounds, and the barley at 5 kroner per bushel of 56 pounds. The prepaid freight to Baltimore, Md. was $1\frac{1}{2}$ kroner per 100 pounds. Find (a) the total cost of the wheat, and (b) the total cost of the barley, if a krone is worth 26.8¢ in U. S. money.

5. A manufacturer of cutlery imported 67,200 pounds of pig iron from Sweden. The freight, on an English ship, to Boston was £2, 10s. per long ton, and the iron cost 112 kroner per long ton in Sweden (1 krone = 26.8¢). How much per long ton did the iron cost when delivered in Boston. (See table on p. 195 for duty.)

INSURANCE

Insurance is an agreement on the part of an individual, a company, or an organization to reimburse another party, up to a certain amount, for loss or injury sustained as a result of a stipulated cause.

The **insurer,** usually a company, is the party who, for a certain fee called the **premium,** assumes the risk.

The **insured** is the party for whom the risk is assumed.

The **insurance policy** is the contract or agreement between the parties. Insurance policies contain many special provisions which affect the contract.

The **rate** is the price charged for insurance. Rates are determined by the insurer, or for the insurer by a group of individuals representing insurers and known as a board of underwriters. Usually rate schedules prepared by experts are used by the insurer.

The **term** of an insurance policy is always made definite. It is usually for one year or a series of years.

There are many kinds of insurances, but all are based on the same fundamental principle. Therefore, **fire insurance**

and **life insurance** are the only kinds which will be treated in this connection.

Fire Insurance

Fire insurance is a contract of indemnity for loss caused directly or indirectly by fire. An indirect loss is one resulting from water used in putting out the fire and from other causes such as exposure, smoke, or the like.

Uniform, or **standard,** policies are policies adopted for use generally by insurance companies operating within a certain district.

The stipulations and conditions contained in insurance contracts are so numerous and varied in various parts of the country that it would not be practicable to give them in detail in this connection. The insured should investigate his insurance contract for himself. Only a few of the more important stipulations and conditions can be given here.

The **80% co-insurance clause** provides that the insured shall carry insurance on his property equal to 80% of its value. In case he does not carry the 80%, the insurer is liable on the policy for such portion only of the loss as the sum insured bears to 80% of the cash value of the property at the time the fire occurred. This clause is designed to encourage owners to carry sufficient insurance. "Co-insurance" means that the owner carries a certain percentage of risk with the insurer, usually 20%.

A specimen co-insurance clause is as follows:

80% CO-INSURANCE

NEW YORK STANDARD CLAUSE

This Company shall not be liable for a greater proportion of any loss or damage to the property described herein than the sum hereby insured bears to.....per cent (%) of the actual cash value of said property at the time such loss shall happen, nor for more than the proportion which this policy bears to the total insurance thereon.

In the event that the aggregate claim for any loss is both less than ten thousand dollars ($10,000) and less than five per cent (5%) of the total

amount of insurance upon the property described herein at the time such loss occurs, no special inventory or appraisement of the undamaged property shall be required.

If the insurance under this policy be divided into two or more items, the foregoing shall apply to each item separately.

Attached to and forming part of Policy No.....of the.....
.....issued at its....., N. Y., Agency.
Dated..... .....Agent.

Except when the policy contains the so-called **lightning clause,** damage caused by lightning is not covered, unless fire results.

The **cancellation clause** provides that either party, insurer or insured, may cancel the policy by giving notice. The insurer must give five days' notice and refund, pro rata, the unearned premium.

The **vacancy clause** specifies the conditions under which the property insured may be left unoccupied. As this clause varies according to locality, the insured should read his policy.

The **alienation clause** provides that in case of a change of ownership the insurer shall be notified and the policy transferred, or it becomes void.

The term **floating policy,** as sometimes used, applies to policies on property moved about, as, for example, automobiles.

A **blanket policy** covers two or more things in one amount, as, for instance, building and equipment under a single policy of $10,000.

A **valued policy** names a definite value to be covered rather than the cash value at the time the loss occurs.

An **open policy** does not state the amount of insurance. It is used to insure stocks of commodities which are being continually increased or diminished, such as goods stored in a warehouse.

One company taking a very large risk may **re-insure** and distribute this risk among other companies.

When two or more companies insure a property, in the event of loss each company pays its pro rata share of the loss.

To find the premium on a fire insurance policy.—

Example.—A store building is insured for $25,000 for three years, of which $15,000 was placed with the Standard Fire Insurance Company, at a premium rate of 94¢ per $100; and $10,000 was placed with the Hartford Fire Insurance Company at 94¢ per $100. Find the total premium paid.

$\frac{\$15000}{100} \times 94¢ = \$141$, the premium paid to the first company

$\frac{\$10000}{100} \times 94¢ = \$94$, the premium paid to the second company

$\$141 + \$94 = \$235$, the total premium paid

Problems

1. A dwelling house was insured for $12,000 with the Hartford Company, at a premium of 50¢ per $100 for three years. Find the premium.

2. A house was insured for $18,000 at 45¢ per $100 for three years; a garage was insured for $1500 at 75¢ per $100 for three years; and a warehouse was insured for $28,000 at $1.12 per $100 for three years. Find the total premium.

3. A merchant took out a policy for $30,000 on his store building for three years at 97¢ per $100 and a policy on his stock of merchandise for $15,000 for one year at 44¢ per $100. Find (a) the total premium paid, (b) his average annual cost of insurance.

4. A contractor took out four term-policies, on four different buildings under construction, to cover construction and material on the job. The first policy was for $44,000 for five months at 28¢ per $100, less 40%; the second policy was for $30,000 for seven months at 32¢ per $100, less 25%; the third and fourth policies were for $20,000 each, for nine months at 33¢ per $100, less 15%. Find the total premium paid. (In short-term policies it is, to some extent, the practice to charge the annual premium and to allow a discount for periods less than a year.)

To find the amount which will be paid by the company under the 80% co-insurance clause.—

Example.—A policy for $25,000 containing the 80% co-insurance clause was issued on a building worth $40,000. If this building is damaged by fire to the extent of $10,000, how much will the insurance company have to pay?

$\$40,000 \times .80 = \$32,000$, the amount of insurance required

$\frac{\$25,000}{\$32,000} = \frac{25}{32} \times \$10,000 = \$7812.50$, the amount the company will have to pay

Problems

The 80% co-insurance clause applies to each of the following problems. Find how much the insurance company will have to pay in each case:

1. A building worth \$50,000 is insured for \$30,000, and damaged by fire to the extent of \$12,000.

2. A building worth \$30,000 is insured for \$18,000, and damaged to the extent of \$6000.

3. A building worth \$12,000 is insured for \$7000, and damaged to the extent of \$4000.

4. A building worth \$80,000 is insured for \$50,000, and damaged to the extent of \$20,000.

To find the premium on short-term policies.—

To find the premium for short-term policies, some insurance companies use a short-rate scale. This indicates in a percentage the portion of the annual premium to be charged for a stated period less than one year.

Example.—A merchant insured a stock of merchandise for 5 months, for \$12,000, at $\frac{4}{5}\%$ premium. The short-term rate is 60% of the annual premium. Find the premium.

$$\$12{,}000 \times \frac{.004}{5}\left(\frac{4}{5}\%\right) = \$96, \text{ the annual premium}$$

$$96 \times .60\ (60\%) = \$57.60, \text{ the short-rate premium}$$

Problems

1. A receiver had a bankrupt stock of goods insured for \$24,000 for 8 months, at $\frac{7}{8}\%$. Find the short-rate premium if it is 80% of the annual premium.

2. A dealer in second-hand automobiles insured his stock of cars for 9 months, for \$30,000, at $\frac{4}{5}\%$ premium. The short-term rate is 85% of the annual premium. How much was the premium?

3. A policy for \$18,000, at $\frac{3}{5}\%$ per annum, was canceled after 7 months. What was the amount refunded to the insured, if the short rate was 75% of the annual rate?

4. A building valued at \$16,000 is insured for three-fourths of its value at 40¢ per \$100 annual premium. If the policy was canceled by the insured after 9 months, how much should be returned to him? The short-term rate is 85% of the annual rate.

5. If the insurer canceled the policy in the preceding problem, the insured would be entitled to a return of $\frac{7}{12} - \frac{9}{12} = \frac{3}{12}$, or $\frac{1}{4}$, of the annual premium. Find how much of the premium paid would be returned.

General Problems

1. A building is insured in three companies as follows: \$20,000 in the Mutual; \$25,000 in the Hartford; \$35,000 in the National. The building is valued at \$100,000 and each policy contains the 80% co-insurance clause. If the building is damaged to the extent of \$40,000, how much will each company have to pay?

2. A house valued at \$10,000 had been insured for \$8000 in two companies for the past 12 years. If the premium was 50¢ per \$100 for three years and the house was destroyed by fire the last month of the twelfth year, what was the net loss of the companies? (No allowance for interest.)

3. A firm had the machinery in one of its factories insured for $\frac{3}{5}$ of its value. The policy was for \$45,000 and contained the 80% co-insurance clause. A fire damaged the machinery to the extent of \$24,000. How much did the company have to pay?

4. A mill valued at \$30,000 and its contents valued at \$15,000 were insured for $\frac{2}{3}$ of their value. The policies contained the 80% co-insurance clause. The mill was totally destroyed, and the contents were damaged to the extent of \$10,000. Find how much the company had to pay.

5. On June 3, 1929, D. W. Harper insured his brick house with the Phoenix Insurance Co., for \$12,000. The premium was 40¢ per \$100 for three years. How much was the premium?

6. J. B. Green paid \$1200 premium to insure his apartment house for \$240,000, which is 80% of its value. (a) Find the rate of insurance. (b) Find the value of the house.

7. A merchant paid \$127.50 annual premium to insure his stock of merchandise at $\frac{3}{4}$% premium. What was the amount of the policy?

8. A school building valued at \$250,000 was insured for 80% of its value in four different companies. (a) If the rate is 60¢ per \$100 for three years, what is the total premium? (b) If the building is damaged by fire to the extent of \$60,000, how much will each company have to pay?

Life Insurance

Life insurance is an agreement by which the insurer, for a consideration, agrees to pay a stated sum at the death of the insured or at some fixed future time.

The **premium** is the price of the insurance. It is usually paid in advance, annually or semiannually.

The **beneficiary** is the person named in the policy to whom the insurance is payable upon the death of the insured.

The three principal kinds of life insurance are (1) **whole or ordinary life**; (2) **limited payment life,** and (3) **endowment.**

Under a whole-life policy, the premium is paid annually in advance during the life of the insured and the policy is payable at his death.

Under a limited-payment life policy, the premium is paid for during a term of years. At the end of this period, the policy is paid in full. The insured may at this time accept the cash value of the policy in settlement or he may allow it to continue in force as paid-up insurance. The policy is always payable at death, whether the term has expired or not.

Under an endowment policy, the premium is paid in advance for a definite term of 10, 15, 20, or 25 years, in the same way as under the limited life policy. At the expiration of the term, the policy is payable in full to the insured. If the insured dies before the term is up, the face of the policy is payable at once.

A **term policy** is a policy issued generally for financial protection during a fixed term. It is payable only in case of the death of the insured during the term, at the expiration of which the insurance ceases.

Insurance contracts provide for certain privileges on the part of the insured. First, he may borrow money from the insurer up to the **loan value** of the policy, as stated therein; second, he may surrender the policy and accept its **cash surrender value,** thereby terminating it; finally, he may discontinue paying the premium and accept paid-up insurance and/or extension of time according to the stipulations in the policy. He may also accept either paid-up insurance or extended term insurance.

Schedule of Annual Premium Rates

The following table shows the annual premium rates for $1000 insurance, on life and endowment policies, for ages 20 to 30 years inclusive, in one of the leading insurance companies:

Age	Life				Endowment			
	Ordinary	10 *Payment*	15 *Payment*	20 *Payment*	10 *Yr.*	15 *Yr.*	20 *Yr.*	25 *Yr.*
20	$19.21	$47.85	$35.46	$29.39	$101.57	$65.93	$48.48	$38.30
21	19.62	48.56	36.00	29.84	101.75	66.09	48.62	38.44
22	20.06	49.30	36.55	30.31	101.88	66.22	48.75	38.58
23	20.51	50.06	37.13	30.80	102.02	66.35	48.89	38.73
24	20.99	50.85	37.73	31.31	102.17	66.49	49.04	38.89
25	21.49	51.67	38.35	31.83	102.32	66.64	49.19	39.06
26	22.01	52.51	38.98	32.37	102.48	66.80	49.36	39.24
27	22.56	53.38	39.65	32.94	102.65	66.97	49.53	39.43
28	23.14	54.28	40.33	33.52	102.83	67.14	49.72	39.64
29	23.74	55.21	41.05	34.13	103.02	67.83	49.92	39.86
30	24.38	56.18	41.78	34.17	103.22	67.53	50.13	40.10

To find semiannual, quarterly, or monthly premium rates.

To find the semiannual, quarterly, or monthly premium rates, multiply the annual premium rate by the following factors:

(a) *for the semiannual premium rate, multiply by* .5088
(b) *for the quarterly premium rate, multiply by* .2575
(c) *for the monthly premium rate, multiply by* .0883

Examples.—**1.** Find the total cost of an ordinary life policy for $10,000, taken at the age of 26 and carried for 17 years.

The premium rate per $1000 is $22.01 (see table)
$22.01 × 10 = $220.10, the annual premium
$220.10 × 17 (17 yr.) = $3741.70, the total cost

2. Had the premium been paid semiannually in the preceding problem, how much more would the insurance have cost?

$22.01 × .5088 = $11.198688, or $11.20
17 × 2 = 34 semiannual periods
$11.20 × 10 = $112, the semiannual premium
$112 × 34 = $3808, the total cost
$3808 − $3741.70 = $66.30, the additional cost

Problems

When the premium rate is not given in these problems, refer to the premium-rate table:

1. A 20-year participating endowment policy for $7500 was taken out by a man 25 years of age. The dividend per $1000 amounted to $300.12. (a) Find the value of the policy at maturity. (b) Find the total cost of the policy. (c) The policy was paid in full at the end of the 20 years. How much did the insured receive in excess of the total premium paid? ($7\frac{1}{2}$ times the dividend per $1000, added to the face of the policy, gives its cash value at the end of 20 years.)

2. Had the insured paid his premium semiannually instead of annually, how much more would his insurance have cost him?

3. A man at the age of 35 took out a 20-payment life policy for $12,000. The annual premium was $38.35 per $1000. He paid 15 premiums before he died. The dividends for the 15 years amounted to $171.53 per $1000. What was the amount of the cash settlement made on this policy?

4. (a) In the preceding problem, if the insured had elected to pay his premium monthly instead of annually, how much more would his insurance have cost him for the full 15 years? (b) Since premiums are paid in advance and the insured died within two months after paying his fifteenth premium, would he have gained or lost by the monthly plan of payment, and how much? (Under the monthly plan, he would not have made the last 10 monthly payments.)

5. A man at the age of 28 took out an ordinary life policy for $5000. He died at the age of 78. The dividends on his policy amounted to $892.32. (a) How much did this policy cost the insured? (b) How much more or less did this policy cost than its cash value at the time the insured died?

6. (a) At the age of 25, find the difference in the cost of a 20-payment life policy and a 20-year endowment policy, each for $2000. (b) The dividend per $1000 for 20 years on the 20-payment life policy was $172.49; on the 20-year endowment policy it was $279.55. The cash value per $1000 of the 20-payment life policy, at the end of the 20 years, was $504.20, not including the dividend; and the cash value per $1000 of the 20-year endowment policy was $1000, not including the dividend. How do the results of the two policies compare?

7. A man at the age of 22 years took out a 25-year endowment policy for $4000. He died after making 20 semiannual premium payments. The cumulated dividend on the policy up to the anniversary of the policy preceding his death was $96.38 per $1000. How much more did his heirs get on the policy than he had paid in premiums?

8. A man at the age of 25 took out a 20-payment life policy for $5000. He discontinued paying premiums after 10 years and accepted the cash surrender value of the policy. If he paid his premiums quarterly, and the

cash surrender value of the policy at the end of the tenth year was $1044.85, how much did he gain or lose?

9. A man 35 years old took out a 20-year endowment policy for $10,000. The annual premium was $51.48 per $1000. He paid 10 premiums and then borrowed at 6% the loan value of the policy, which was $4075. At the end of the 20-year period the dividends amounted to $317.75 per $1000. The interest and premiums were paid regularly. (a) How much did the insured pay the insurer in interest and premiums during the 20 years? (b) Show the cash settlement results for this policy at the end of the 20 years.

10. J. C. Crane has the following insurance policies on his life: 20-payment life for $20,000 in the Fidelity Mutual, at $32.36 per $1000; 10-year endowment for $15,000 in the Home Life, at $102.77 per $1000; 15-payment life for $25,000 in the Equitable Life, at $49.27 per $1000. Find the total annual premium which Mr. Crane has to pay.

CORPORATION STOCKS

Corporations are either public or private.

Public corporations are formed for governmental purposes. They include towns, villages, and cities.

Private corporations are organizations of individuals, authorized by law for many different purposes.

The two kinds of private corporations are **stock** and **non-stock.**

Stock corporations are organized for business purposes under a charter granted by the state, which authorizes them to transact business, within prescribed limits, in the same way as an individual.

Non-stock corporations are organizations for religious, educational, charitable, and social purposes. They also hold a charter from the state, which outlines the general purposes and privileges of the organization.

In this study of arithmetic, we are concerned primarily with investments in stock corporations.

The **capital** of a corporation is the amount of its assets at any time.

The **capital stock** of a stock corporation is the amount authorized to be paid into the corporation to be used in conducting its business.

The capital stock of a corporation is divided into a certain number of **shares,** having a face value of a stated amount, usually $100.

A **dividend** is a sum of money paid by a corporation to its stockholders according to the number of shares owned by each.

Common stock is the regular stock of a corporation. It is given no preference in the distribution of profits or assets. Whatever profits are left after the dividends have been paid on preferred stock are paid on it.

Preferred stock is stock which carries with it an agreement that a stated dividend, or percentage of profit, will be paid on it before any dividend will be paid on the common stock. It will also be given preference in the distribution of assets.

Cumulative preferred stock carries a guarantee that in case the regular dividends, for some reason, are not paid when they should be, they will be allowed to cumulate and will be paid later before any dividends are paid on the common stock.

The following is a typical certificate of stock:

Form 10.—Certificate of Stock.

A stockholder's interest, or his investment, in a corporation is represented by the stock certificate, which shows the number of shares purchased and the par value of each share.

The **par value** of a share is its face value.

The **market value** of stock is the price at which it can be purchased. According as a stock pays a good dividend, the demand for it, and consequently its price, increases.

No-par stock is stock that has no par value. It is offered to subscribers, or first purchasers, at a certain price, and after the first sale its value depends on the market price. It has a market value only.

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Fig. 32a.—The Old New York Curb Market Prior to 1921. The Photograph Shows a Crowd of Stock Buyers and Sellers Gathered "on the Curb" in Broad Street.

A **stock broker** is one who buys and sells stocks for other people. His fee is called **brokerage.** The brokerage rate charged for his services is usually $12\frac{1}{2}¢$ a share, or $\frac{1}{8}$ of 1% of the par value of the stock, for buying and for selling.

On the New York City Stock Exchange the fees are as follows:

For stock selling under $10 per share—$7.50 per 100 shares										
"	"	"	at $10 and under $25—$12.50 per 100 shares							
"	"	"	"	25	"	"	50—	15.00	"	" "
"	"	"	"	50	"	"	75—	17.50	"	" "
"	"	"	"	75	"	"	100—	20.00	"	" "
"	"	"	"	100	"	"	200—	25.00	"	" "
"	"	"	"	200 and over			—$25 for the first $200 and $5 additional for each $50 or fraction thereof per 100 shares			

Buying a membership seat on a stock exchange means buying a right to trade in stock on the floor of the exchange.

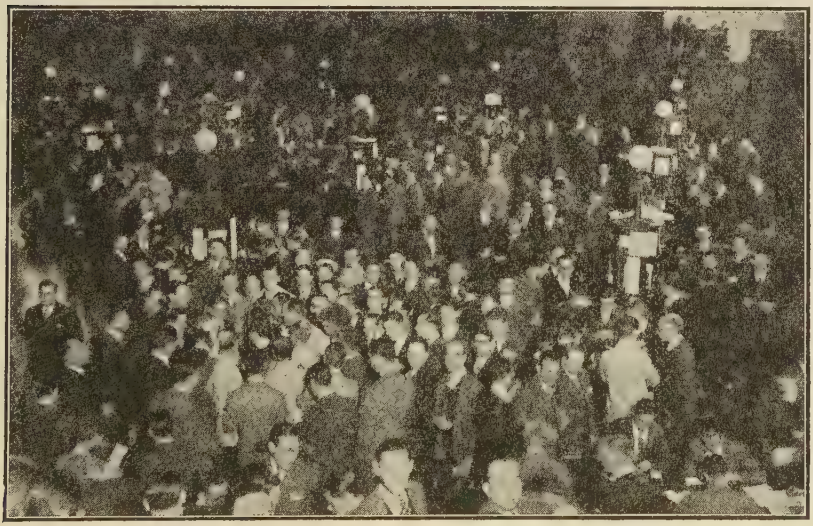

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Fig. 32b.—Scene in the Interior of the New York Curb Market To-day as the Trading Begins at 10 A.M. Each Week-day. On the Floor are the 16 Trading Posts, Each Surmounted by Its Electric Globe. In the Background are the Pulpit-like Seats Occupied by the Telephone Clerks, Who are in Direct Touch with the Various Brokerage Houses.

Listed stocks are stocks which may be bought and sold on the floor of a stock exchange.

Unlisted stocks are stocks which may be dealt in by the members of a stock exchange or by any one else, but which cannot be bought and sold on the floor of the exchange. As a result, trading is carried on "on the curb."

The **New York Curb Market** got its name from the practice of a group of stock owners, traders, and brokers meeting regularly in a certain New York City street (Broad Street). Here they stood on and near the street curb, buying and selling stocks and bonds. This practice was carried on for years. The business of the Curb Market increased until an organization of traders and brokers developed. Rules of procedure and conduct were adopted, and finally the Curb Market became one of the great stock markets of the world. At the present time trading in stocks and bonds is no longer carried on in the street.

The Curb Market is housed in its own building, at 78 Trinity Place, which was opened in 1921. The Curb Market is conducted at the present time in much the same way as the New York Stock Exchange or other stock exchanges.

SELECTED QUOTATIONS FROM NEW YORK STOCK EXCHANGE TRANSACTIONS

Sales	*Stock*	*First*	*High*	*Low*	*Last*	*Net Chge.*
100	Am. Ry. Express	131	131	131	131	*2 1/2*
3900	Am. Tel. and Tel	199 3/4	199 7/8	198 3/4	199 1/2	*3/8*
100	Baltimore & Ohio R. R	79	79 1/8	79	79 1/8	*1/8*
2400	Colorado Fuel & Iron	72 3/8	72 3/8	71	71 1/2	*1/8*
400	Eastman Kodak	181 1/4	181 1/4	181 1/4	181 1/4	*1 3/4*
600	Gen. Motors, pf	125	125 1/4	125	125 1/4	
1700	Gt. Northern R. R., pf	108 1/4	108 1/4	108	108	*1/8*
2400	Int'l. Harvester	96 3/8	97 1/4	96	96 7/8	*7/8*
1800	Loose-Wiles Biscuit	71 7/8	71 7/8	70 5/8	70 5/8	*1/8*
8300	Montgomery Ward	141 3/4	142	140 1/2	141 3/4	*1 1/4*
8200	Nash Motors	104 5/8	105 1/2	104 5/8	104 7/8	*5/8*
5400	Pillsbury Flour Mills	60	61 3/4	60	61 1/2	*3/8*
1500	United States Rubber, 1st pf	88 1/2	88 1/2	88	88	*2 7/8*
558100	United States Steel	182	189	181 3/8	188 1/2	*8 1/4*
3700	F. W. Woolworth Company	214 3/4	214 3/4	213 1/2	214 5/8	*4 1/2*

"Sales" means the number of shares bought and sold; "first," the price the first sale brought; "high," the highest price at which a sale was made during the day; "low," the lowest price at which a sale was made during the day; "last," the last price at which a sale was made that day; "net change," the difference between to-day's last price and yesterday's last price.

Exchange prices are quoted in dollars or cents per share. Thus, "131" means $131 per share, par value $100.

A **"bull"** is a trader who operates for a rise in prices.

A **"bear"** is a trader who operates for a decline in prices.

A trader who buys stock to hold for a rise in prices is said to be "long" in stocks. A trader who sells stock he does not own, expecting to buy and make delivery at a lower price, is said to be "short."

Buying stock on a **margin** is a common practice. This means that the trader furnishes only a part, or margin, of the money necessary for the transaction and that the broker finances the transaction by loaning the remainder of the purchase price; or the trader may borrow it from a bank. In either case, he deposits the stock with the lender as security. The loan which a bank makes to the broker is usually known as a **call loan.** That is, the banker may demand payment of the loan at his pleasure.

"Call money" brings a high rate of interest when money is in great demand for investment, but when this is not the case, its rate is lower than the regular rate charged by banks.

There is a Federal Tax, levied at the rate of 2¢ per share on a par value of $100, on all sales of stock. In New York State there is an additional tax of 2¢ per share on all sales of stock. Both these taxes must be paid by the seller. Therefore, stock sold on the New York Exchange must bear a tax of $4 per 100 shares, par value $100. If the par value is less than $100, the tax is proportionately less, according to the number of shares. Thus, if the par value is $50, the tax per share would be 1¢, Federal Tax.

To find the cost of stock when the price, the number of shares, and the brokerage charge are given.—

Example.—M. A. Harper placed an order with his broker for the purchase of 50 shares of American Telephone and Telegraph stock. The broker bought the stock on the New York Exchange for $191\frac{1}{2}$. How much did it cost?

50 shares × $191\frac{1}{2}$ = $9575, the purchase price
50 shares × 25¢ (25 per 100 sh.) = $12.50, the brokerage fee
$9575 + $12.50 = $9587.50, the total cost

Problems

In the problems that follow, use the "last" quotations and the brokerage prices for the New York Exchange given in this chapter, unless other directions or the prices are given in the problems.

1. Find the cost on the New York Exchange of the following stocks:

200 shares Colorado Fuel and Iron
50 shares General Motors, pf.
250 shares United States Rubber, 1st pf.

Reckon brokerage in each purchase.

2. Using the "low" quotations as given, find the cost of 150 shares of Montgomery Ward stock; 60 shares of Nash Motors stock; and 75 shares of United States Steel stock. Reckon brokerage at the N. Y. Exchange prices.

3. Find the cost of 200 shares of F. W. Woolworth Company stock purchased at the "first" quotation. Brokerage at N. Y. Exchange prices.

To find the proceeds of a sale of stock when the selling price, the number of shares, the brokerage fee, and the percentage of tax are given.—

Example.—Find the proceeds from the sale of 250 shares of Eastman Kodak stock. The tax is 2¢ Federal and 2¢ State on each share.

250 shares × $181\frac{1}{2}$ = $45,375.00, the selling price
250 shares × 25¢ ($25 per 100 shares) = $62.50, the brokerage fee
250 shares × 4¢ (4¢ tax) = $10, the tax
$62.50 + $10 = $72.50, the total charges
$45,375.00 − $72.50 = $45,302.50, the proceeds

Problems

1. Find the profit or loss on each of the following stocks purchased on the New York Exchange: (a) 50 shares of B. and O. R. R. stock, bought at $70\frac{1}{4}$ and sold at $79\frac{1}{8}$ (see quotations); (b) 100 shares of Great Northern R. R. stock, bought at $99\frac{1}{2}$ and sold at $108\frac{1}{4}$; (c) 40 shares of International Harvester stock, bought at $104\frac{3}{4}$ and sold at $96\frac{7}{8}$.

2. Find the proceeds from the sale of 75 shares of American Railway Express stock at 131, brokerage at the N. Y. Exchange rate. (This sale is subject to both State and Federal taxes.)

3. Find how much was gained on 200 shares of General Motors Pf. stock, bought at $109\frac{3}{4}$ and sold at the "high" in the quotations given. (Federal tax, 2¢ a share.)

To find the number of shares that can be bought at a given price and brokerage charge.—

Example.—How many shares of Pillsbury Flour Mills stock can be bought for $5000 on the N. Y. Exchange, at the "last" price as quoted?

$61.50 + 17½¢ brokerage = $61.67½, the cost per share
$5000 ÷ $61.67½ = 81, the number of shares, and $4.325 remaining

Problems

1. How many shares of Loose-Wiles Biscuit stock can be bought for $4000 on the N. Y. Exchange, at the "low" price as quoted? (Only whole shares can be purchased, and the remaining sum is returned to the purchaser.)

2. (a) How many shares of U. S. Rubber 1st Pf. stock can be bought for $10,000 on the New York Exchange at the "first" price as quoted? (b) Find the dividend on this stock at 5½%.

3. D. W. Hayes sold 50 shares of American Telegraph and Telephone stock at the "high" price as quoted, and with the proceeds he purchased General Motors Pf. stock at the "last" price as quoted. (This is a New York Exchange transaction.) Find the number of shares of General Motors stock purchased.

4. A man bought 60 shares of U. S. Rubber at the "first" price. The annual dividend is 5½%. Find (a) how much he paid for the stock and (b) the annual dividend on his stock.

5. A broker sold for his client 150 shares of Nash Motors stock at the "high" price on the New York Exchange. (a) How much did this stock cost the purchaser? (b) Find the amount of the first dividend at 6¼%.

To find the amount that must be invested to yield a certain income when the dividend rate is given.—

Example.—How much must be invested in Eastman Kodak stock, at the "last" price, to yield an annual income of $2250, if the stock pays a dividend of 4½% semiannually?

4½% × 2 = 9%, the annual dividend
$100 × .09 (9%) = $9, the dividend on 1 share
$2250 ÷ $9 = 250, the number of shares
$181¼ + 25¢, or $¼, per share brokerage = $181½, the cost per share
250 × $181½ = $45,375, the investment

Problems

1. How much must be invested in United States Steel stock, at the "first" price, to yield an annual income of $4000, if the dividend is 8% annually?

2. If Nash Motors stock pays a dividend of 6¼% annually, how much must be invested in Nash stock, at the "low" price, to yield an income of $1250 annually?

3. How much must be invested in International Harvester stock, at the "first" price, to yield an income of $3300, if the annual dividend is 5%?

4. D. H. Allen invested in Great Northern R. R. stock, which paid 3½% in dividend semiannually. If his income from this stock was $4200 annually, how much did he invest at the "first" price of the stock?

To find the price at which stock, paying a given dividend, should be bought to yield a certain percentage of profit.—

Example.—At what price should 5% stock be purchased to yield 6% on the investment?

$100 × .05 (5%) = $5, the dividend on 1 share
$5 ÷ .06 (6%) = $83⅓, the price of 1 share

Problems

1. At what price should 4% stock be purchased to yield 5% on the investment?

2. If your money is earning 6% interest, how much can you pay for stock, paying a semiannual dividend of 3½%, without decreasing your income?

3. You own stock paying 6¼% annually. At the present market price it is yielding only 5% annually. What is the present market price?

4. At what price must you buy 60 shares (par value, $100) of B. and O. R. R. stock, paying 4½% in dividend annually, so that your investment will yield 6%?

To find the percentage of profit on a stock when the dividend rate, the purchase price, and brokerage fee are given.—

Example.—Colorado Fuel and Iron stock pays 5% dividend annually. If this stock is bought at the "low" price, what rate per cent does it pay on the investment?

$100 × .05 (5%) = $5, the dividend on 1 share
$71 + 17.5¢ brokerage = $71.175, the cost of one share
$5 ÷ 71.175 = .07025, or 7.025%, profit on the investment

Problems

1. If General Motors 7% pf. stock is bought at the "low" price, what rate per cent will it pay on the investment?

2. What rate per cent on the investment will stock pay when it costs $155\frac{1}{4}$ per share plus 25¢ brokerage, and the dividend is 8% annually?

3. Which is the better investment and how much better: (a) stock bought at $112\frac{1}{4}$, paying 6% dividend, or (b) stock bought at $81\frac{3}{4}$, paying 5% dividend?

4. L. G. Ford sold 75 shares of Montgomery Ward $7\frac{1}{2}$% stock at the "high" price, and invested the proceeds in Nash Motors 6% stock at the "low" price. The brokerage was 25¢ a share and the Federal Tax on the stock sold was 2¢ a share. Show how his income would be affected.

General Problems

1. (a) What annual income is derived from investing $35,000 in Colorado Fuel and Iron Stock at $70, if the annual dividend is $4\frac{1}{2}$%? (b) Find the total cost of this stock, if it was purchased on the New York Exchange.

2. The G. N. R. R. Co. paid $3\frac{1}{4}$% semiannual dividend on $150,000,000 of common stock, and $2\frac{3}{4}$% semiannual dividend on $100,000,000 of preferred stock. (a) Find the total dividend paid. (b) How much did a stockholder receive who owns 250 shares of common stock and 150 shares of preferred stock?

3. The common stock in the preceding problem was purchased at $105 and the preferred stock at $95. Not reckoning the brokerage, what rate of interest did this stockholder get on his investment?

4. Which is the better investment and how much better: (a) stock purchased at 88 and paying $5\frac{1}{4}$% dividend, or (b) stock purchased at 125 and paying 7% dividend, brokerage $\frac{1}{4}$%?

5. A man invested $15,000 in stock at par ($100). His annual dividend was $975. (a) What was the rate of dividend? (b) If money is worth 6% interest, what is the market value of this stock?

6. A man invested $12,500 in G. M. Pf. at 125, including brokerage. He received one annual dividend at $6\frac{1}{2}$% and sold the stock at $131\frac{1}{4}$; brokerage, $\frac{1}{4}$%, and taxes, 4¢ a share. How much profit did he make on his investment?

7. How much must be invested in stock at $124\frac{1}{2}$, paying 7% dividend annually, to yield an income of $2800? Reckon brokerage at the New York Exchange rate.

8. (a) At what price must one buy $7\frac{1}{2}$% stock to yield 6% interest on the investment? (b) How much will 120 shares cost at this price, if

brokerage is 25¢ per share? (c) At 7½%, how much dividend will 120 shares yield?

BONDS

A **bond** is a secured credit instrument, under seal, which carries with it a promise to pay a specified sum of money within a fixed time, and to pay interest thereon at a fixed rate at regular intervals.

The most common bonds are **government, municipal,** and **corporation bonds.**

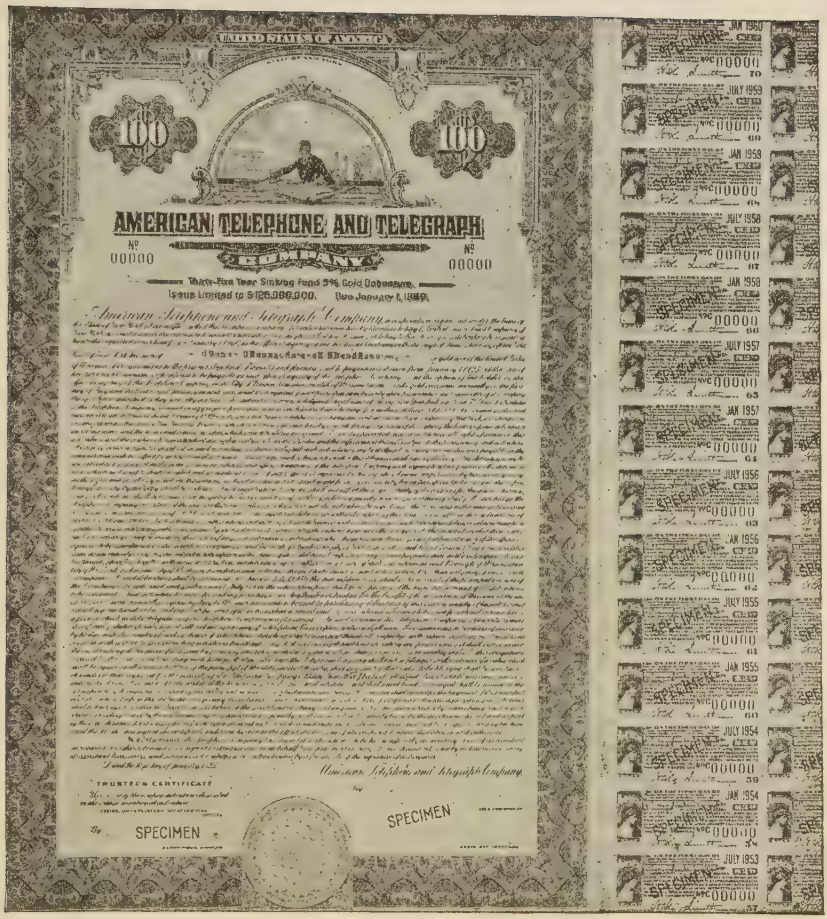
Bonds are designated by many different names, depending upon the source of the bond and the purpose for which the money is borrowed. The quotations published in newspapers give a good idea of the many different bond designations. Examples are: "Amalgamated Sugar Co., 1st 7s, 1937"; "Denver, Col., water, 4½s, 1948"; "Farmers Mfg., 1st 7s, 1943"; "U. S. Treas., 4s, 1944–54"; "Berlin, 6s, 1958", etc. Besides serving to identify the bond, these designations tell who issued the bonds, the interest rate, and the date on which the sum will be repaid. For instance, "City of Chicago Tax Relief Bonds" means that these bonds were issued and sold by the City of Chicago to make up a deficit resulting from taxes not paid promptly, or within a certain time, by the taxpayers. The interest rate is indicated by the figure before s. Thus, "7s" stands for "7 per cents."

The two principal kinds of bonds are **registered bonds** and **coupon bonds.**

Registered bonds are recorded on the records of the companies or municipalities issuing the bonds. This record shows the name and address of the owner, together with such other information as will make it possible to mail the interest check, when due, to the owner.

Coupon bonds are bonds to which interest coupons are attached. When these interest coupons become due, they are detached by the owner of the bond and cashed like a check at the office of the issuing company or at a bank.

The following is an illustration of a coupon bond:



Form 11.—Coupon Bond.

Bonds are bought and sold through agents and brokers in much the same way as stocks. Many banks act as agents for their depositors in the purchase and sale of bonds. Sometimes banking houses or bonding companies take over whole issues of bonds and sell them directly to their customers.

The rate of commission, or the brokerage fee, charged by brokers for buying and selling bonds for their customers is usually $\frac{1}{8}\%$ or $12\frac{1}{2}¢$ on $100 of the par value of the bond. Most brokers have a minimum charge.

Bonds bear interest at a definite rate, which is payable at fixed intervals, usually annually or semiannually.

Bonds have a **par value** and a **market value.** The par value is the face value of the bond, and the market value is what it will sell for. These values are rarely the same. The kind of security a bond has and the rate of interest it bears help to influence its market value.

Bonds that sell for less than their par value are said to sell at a **discount,** and bonds that sell for more than their par value, at a **premium.**

When bonds become due, they are usually paid at their face value. Sometimes, when the issuing company reserves the right to call its bonds before they are fully due, it will redeem them at a premium.

A bond owner is a creditor of the municipality or corporation issuing the bond. Bonds are purchased usually for an investment. A stockholder in a corporation, on the other hand, is a part owner, and stock is very often purchased as a speculation.

The interest on a bond is fixed, while dividends on stock depend on the earnings of the corporation and are declared by the directors. Bond quotations are given in daily papers and in financial publications in about the same way that stock quotations are given.

To find the cost of bonds when the purchase price and brokerage charge are given.—

Examples.—

1. Find the cost of 20 bonds, $1000 Republic of Peru, 5s, 1946, purchased at $95\frac{1}{2}$, brokerage, $\frac{1}{8}\%$.

$\$1000 \times 20 \times 95.625$ ($95\frac{1}{2} + .00\frac{1}{8}$) = $19,125, the cost

Had this bond been purchased after interest had accumulated for part of a period, the accumulated interest unpaid would have been added to the purchase price.

2. Find the cost of 50 bonds, \$500 Cleveland Southwestern R. R., 6s, 1954, purchased at \$102¾ on Oct. 1; brokerage, ⅛%. The interest dates are Jan. 1 and July 1.

\$500 × 50 × 1.02⅞ (1.02⅝ + .00⅛) = \$25,718.75, the first cost
\$25,000 at 6% for 3 mo. = \$375, the accumulated interest
\$25,718.75 + \$375 = \$26,093.75, the total cost

The cost of a bond is equal to the market price, plus the brokerage, plus the accumulated interest.

Problems

1. Find the cost of 25 Tennessee Copper Corporation, 6s, 1941, of \$1000 each, purchased on July 1, on which the interest is payable annually on April 1; brokerage, ⅛%.

2. On Sept. 1, J. C. Mansfield purchased three \$10,000 Westinghouse Electric Manufacturing Company, 20 year, 5s, 1946, at \$110; brokerage, ⅛%. The interest is payable annually on March 1. Find the cost.

3. Find the cost of a \$20,000 Denver Co., water, 4½s 1948, purchased Dec. 1, at \$87.50, brokerage, ⅛%, if the interest is payable annually on April 1.

4. The face of a bond is \$500; the rate of interest is 6½%, payable semi-annually on April 1, and October 1; the market value is 106⅜. Find the cost of 40 of these bonds purchased on July 15; brokerage, ⅛%.

5. The face of a bond is \$1000; the rate of interest is 4½%, payable annually on March 1; the market value is 83¼. Find the cost of 75 of these bonds purchased June 10; brokerage, ⅛%.

To find the proceeds of a sale of bonds when selling price, brokerage, and interest are given.—

Example.—Find the proceeds of ten 5½% \$500 bonds of the Consolidated Gas and Electric Company, interest payable April 1, if sold June 16 at 95½; brokerage, ⅛%.

\$500 × 10 × 95⅜ (95½ − .00⅛) = \$4768.75, the market price
\$5000 at 5½% for 75 days = \$57.29, the interest
\$4768.75 + 57.29 = \$4826.04, the proceeds

The proceeds equal the selling price, minus the brokerage, plus the accumulated interest.

Problems

1. Find the proceeds from the sale of five 5% $1000 bonds sold on Dec. 1, at $98\frac{1}{8}$, brokerage $\frac{1}{8}$%, interest payable annually on June 1.

2. Find the proceeds from the sale of twenty-five $4\frac{1}{2}$% $100 bonds sold on Sept. 1, at $88\frac{3}{8}$, brokerage $\frac{1}{8}$%, interest payable annually on March 1.

3. J. H. King sold six $5\frac{1}{2}$% $2000 bonds on May 16, at $94\frac{1}{4}$, brokerage $\frac{1}{8}$%. If the interest date is April 1, find the proceeds.

4. W. D. Long sold fifteen 7% $5000 bonds on Oct. 21, at $122\frac{1}{8}$, brokerage $\frac{1}{8}$%. If the interest date is June 1, find the proceeds.

To find the price at which a bond must be bought to yield a given rate of interest.—

Example.—What price can be paid for a $500 6% bond, maturing in 4 years, to yield 5% on the investment?

$500 + $30 interest for 1 year = $530
$530 ÷ 1.05 = $504.76, cost the first year
$504.76 + $30 interest = $534.76
$534.76 ÷ 1.05 = $509.30, cost the second year
$509.30 + $30 interest = $539.30
$539.30 ÷ 1.05 = $513.62, cost the third year
$513.62 + $30 interest = $543.62
$543.62 ÷ 1.05 = $517.71, cost the fourth year

To find the price at which a bond should be bought in order to yield a given rate of interest:

1. *Add the interest for one period at the bond rate to the face of the bond.*

2. *Divide by* $1 *plus the interest for one period at the given rate.*

3. *Add the interest at the bond rate to this result.*

4. *Divide again by* $1 *plus the interest for one period at the given rate.*

5. *Continue in the same way for the full time.*

Problems

1. What price must be paid for a 6% $1000 bond, maturing in 3 years, to yield 5% on the investment?

2. What price must be paid for a 7% $2000 bond, maturing in 4 years, to yield 5% on the investment?

3. What price must be paid for a $1500 bond at 3% semiannually, maturing in 2 years, to yield 5% on the investment?

4. What price must be paid for a $1000 bond at 2½% semiannually, maturing in 1½ years, to yield 6% on the investment?

5. What must be paid on April 1 of a certain year for a $500 bond, at 6% annually, maturing on April 1, 3 years later, in order to yield 5% interest on the investment?

How to Use Bond Tables

The following is an example of a bond table:

10 Years—Interest Payable Semiannually

Net Rate per Annum	*Bonds Bearing Interest at the Rate of*						
	3%	3½%	4%	4½%	5%	6%	7%
3	100.00	104.29	108.58	112.88	117.17	125.75	134.34
3⅛	98.93	103.20	107.46	111.73	116.00	124.53	133.06
3¼	97.88	102.12	106.36	110.60	114.84	123.32	131.80
3⅜	96.84	101.05	105.27	109.48	113.70	122.12	130.55
3½	95.81	100.00	104.19	108.35	112.56	120.94	129.32
3⅝	94.80	98.96	103.12	107.29	111.45	119.77	128.10
3¾	93.79	97.93	102.07	106.21	110.34	118.62	126.89
3⅞	92.80	96.92	101.03	105.14	109.25	117.48	125.71
4	91.82	95.91	100.00	104.09	108.18	116.35	124.53
4⅛	90.86	94.92	98.98	103.05	107.11	115.24	123.36
4¼	89.00	93.94	97.98	102.02	106.06	114.14	122.21
4⅜	88.96	92.97	96.99	101.00	105.02	113.05	121.08
4½	88.03	92.02	96.01	100.00	103.99	111.97	119.95
4⅝	87.11	91.07	95.04	99.01	102.98	110.91	118.84
4¾	86.20	90.14	94.08	98.03	101.97	109.86	117.75
4⅞	85.30	89.22	93.14	97.06	100.98	108.82	116.66
5	84.41	88.31	92.21	96.10	100.00	107.79	115.59
5⅛	83.54	87.41	91.28	95.16	99.03	106.78	114.53
5¼	82.67	86.52	90.37	94.22	98.07	105.78	113.48
5⅜	81.81	85.64	89.47	93.30	97.13	104.79	112.45
5½	80.97	84.77	88.58	92.39	96.19	103.81	111.42
5⅝	80.13	83.92	88.11	91.48	95.27	102.84	110.41
5¾	79.31	83.07	86.83	90.59	94.36	101.88	109.41
5⅞	78.49	82.23	85.97	89.71	93.45	100.94	108.42
6	77.68	81.40	85.12	88.84	92.56	100.00	107.44

The rates of interest listed horizontally across the top of the table illustrated above are the rates of interest that different bonds bear. The interest rates listed in the perpendicular column to the left under "Net Rate per Annum" are the rates of interest that the different bonds will yield if purchased at the prices listed in the horizontal column directly opposite and under the different interest rates.

Example.—To find how much should be paid for a $4\frac{1}{2}\%$ bond to yield 5% in 10 years.

Follow the interest column at the top of the table across to $4\frac{1}{2}\%$, and then down the perpendicular column directly under this heading until opposite 5% in the rate column at the left. There it is found that \$96.10 can be paid for a \$100 bond at $4\frac{1}{2}\%$ interest to yield 5%.

The table illustrated is an abridged form of a bond table to be used for the purpose of teaching the method of using bond tables. Very complete and extensive bond tables are available wherein the rates used range from $1\frac{5}{8}\%$ to 8%, and the periods of time range from 1 to 60 years.

Problems

A. Using the table illustrated, find the price at which bonds maturing in 10 years can be bought to yield the rate of interest given in each problem:

1. 4 % bonds to yield 6 %.
2. $3\frac{1}{2}\%$ bonds to yield 5 %.
3. $4\frac{1}{2}\%$ bonds to yield $5\frac{1}{2}\%$.
4. 5 % bonds to yield $4\frac{1}{2}\%$.
5. 6 % bonds to yield 7 %.
6. $4\frac{1}{2}\%$ bonds to yield $5\frac{1}{2}\%$.
7. $3\frac{1}{2}\%$ bonds to yield $4\frac{1}{2}\%$.
8. 6 % bonds to yield 5 %.

B. Using the table, find the rate of interest which bonds maturing in 10 years will yield, if purchased at the price given:

1. 4 % bonds purchased at 96.99.
2. 6 % bonds purchased at 107.79.
3. 5 % bonds purchased at 92.56.
4. $3\frac{1}{2}\%$ bonds purchased at 88.31.
5. $4\frac{1}{2}\%$ bonds purchased at 92.39.
6. 7 % bonds purchased at 119.95.
7. 3 % bonds purchased at 91.82.
8. $4\frac{1}{2}\%$ bonds purchased at 88.84.

General Problems

1. A man paid $122\frac{1}{4}$ for 7% bonds, brokerage $\frac{1}{8}\%$. What per cent of profit did his investment yield?

2. D. W. Moore invested in fifty $4\frac{1}{2}\%$ \$500 bonds at $73\frac{1}{4}$, brokerage $\frac{1}{8}\%$. What per cent did his investment yield him?

3. Government bonds, bearing interest at $4\frac{1}{2}\%$, sell for $101\frac{3}{8}$, brokerage $\frac{1}{8}\%$. What rate of interest do they yield?

4. When 5% bonds are selling at $95\frac{1}{4}$, brokerage $\frac{1}{8}\%$, how much must be invested to produce an income of \$2500?

5. Which is the better investment and how much better, (a) $4\frac{1}{2}\%$ bonds purchased at $77\frac{1}{4}$, or (b) 6% bonds purchased at $105\frac{3}{8}$, brokerage $\frac{1}{8}\%$?

6. O. E. Haver invested \$8387.50 in $5\frac{1}{2}\%$ stock at $83\frac{3}{4}$, brokerage $\frac{1}{8}\%$. What was his annual income from this stock?

7. In the preceding problem, if Mr. Haver kept this stock for one year, received his interest and then sold the stock for $92\frac{1}{2}$, brokerage $\frac{1}{8}$, how much did he gain?

8. Find the cost of fifteen 5% \$1000 bonds, purchased on Aug. 1, at $88\frac{1}{2}$, brokerage $\frac{1}{8}\%$, if the interest date is May 1.

EXCHANGE

Exchange, as treated in this connection, is a means of making remittances to persons or institutions in distant places without sending the actual money.

The two kinds of exchange are **domestic** and **foreign.**

Domestic exchange is confined to remittances between different places in the same country; for example, between New York and Chicago.

Remittances may be made by means of personal checks, post office money orders, express money orders, telegraph money orders, bank drafts, and commercial drafts.

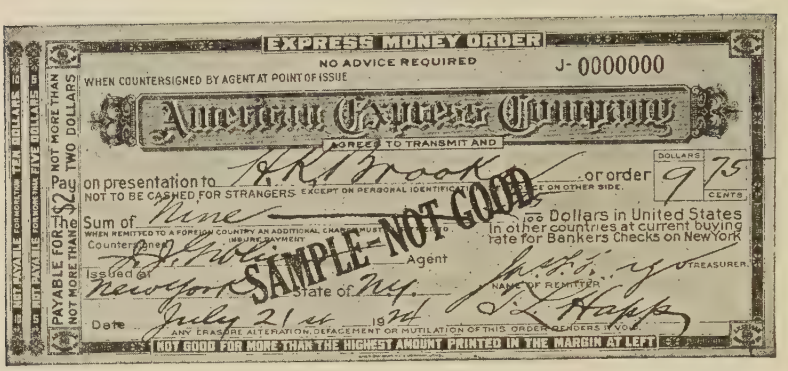
When a personal check is sent to a distant place, it is deposited by the receiver in the local bank where he does his banking business. By the process of exchange, it finds its way back to the place from whence it was sent and to the bank on which it was drawn.

Money orders—postal, express, and telegraph—are purchased by the sender at a rate depending on the amount. Since the rates vary from time to time, the student would do well to ascertain them at first hand from his local post office, express station, or telegraph bureau.

For post office money orders, the rate ranges from 5¢, for an order for \$2.50, up to 22¢ for an order for \$100. No single order is sold for more than \$100.

Express money orders, sold at any office of an express company, are usually payable at any other office of the same company. The rates range from 10¢ for an order of \$5 up to 24¢ for one of \$100, 48¢ for \$200, and so on.

On p. 224 is shown a specimen express money order:



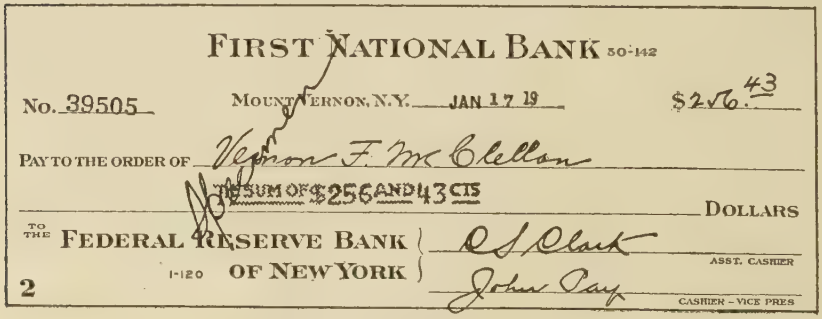
Form 12.—Express Money Order.

Money may be transmitted by telegraph from one place to another. This is done by the sender paying in to the local telegraph office the amount he wishes to transmit. A message is then sent, directing the telegraph office at the place named in the message to pay to a certain party the amount specified therein. Rates may be secured from any telegraph office.

Drafts

A **bank draft** is an order drawn by one bank on another bank, directing the bank on which it is drawn to pay a certain sum to a certain party named in the draft. Bank drafts pass as currency and are payable on demand.

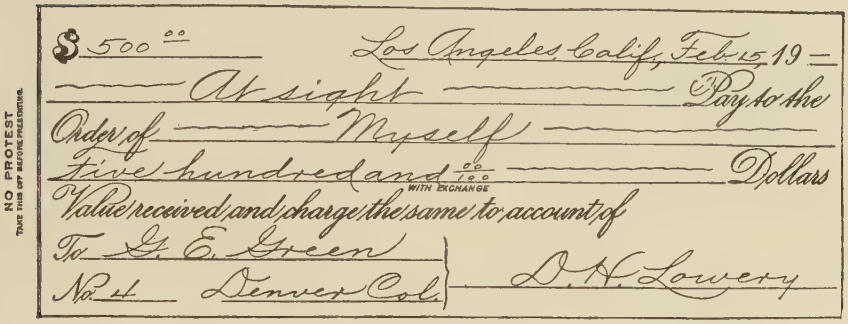
The following is an illustration of a bank draft:



Form 13.—Bank Draft.

The **commercial draft** is used by a creditor as a means of collecting an account from his debtor. It is an order drawn by one party (the **drawer**) on another party (the **drawee**), directing him to pay a third party (the **payee**), named therein, a certain sum of money. If the second party accepts the draft, he writes "Accepted" and his name on the face of the draft. The drawer may make the draft payable to himself, instead of to a third party, and have it collected by a bank or a collecting agency.

The following is an example of a sight draft:



Form 14.—Sight Draft.

Mr. Lowery, the drawer, can endorse this draft to a bank in Los Angeles, and the Los Angeles bank will send it to a bank in Denver. The latter will collect it and remit the proceeds, after deducting the collection charge, to the Los Angeles bank, which will place the amount to Mr. Lowery's credit and notify him that the draft has been collected. If the draft is dishonored (not paid), it is returned.

The Federal Reserve Bank, through its twelve branches in different parts of the country, maintains at all times a fairly even distribution of currency and specie the country over. Thus, there is little occasion, in the case of domestic exchange, for unusual premium or discount rates other than those which are charged regularly to cover the expense of the service. Regular customers of a bank are not, as a rule, required to pay for this service.

To find the cost of exchange when the amount and the commission are given.—

Example.—Find the cost of a draft at New York on Miami for \$2800 at $\frac{1}{10}\%$ commission.

$\frac{1}{10}\%$ of \$1 = \$.001
\$2800 × \$.001 = \$2.80, the exchange
\$2800 + \$2.80 = \$2802.80, the cost

or

\$2800 × $\frac{1}{1000}$ ($\frac{1}{10}\%$) = \$2.80, the exchange
\$2800 + \$2.80 = \$2802.80, the cost

Problems

1. Find the cost at Chicago of a draft for \$7500 on San Francisco, at $\frac{1}{20}\%$ commission.

2. Find the cost at Denver of a draft for \$12,500 on New York, for which a service charge of $\frac{1}{50}\%$ is made.

3. Find the cost at Boston of a draft for \$9000 on New York, plus a service charge of $\frac{1}{20}\%$.

4. Find the cost of 4 P. O. money orders as follows: 1 for \$20 at 15¢; 2 for \$60 at 20¢ each; 1 for \$84 at 22¢.

5. Find the cost of sending \$1000 by telegraphic exchange from New York to Chicago, if the rate is \$4.07 plus 72¢ for the message.

To find the proceeds of a draft for a certain amount when the discount and collection rate are given.—

Example.—Find the proceeds of a 30-day sight draft for \$2500, if it is discounted at 6% on the day it is accepted, and the collection rate is $\frac{1}{4}\%$.

\$2500 at 6% for thirty days = \$12.50, the discount
\$2500 × .0025 ($\frac{1}{4}\%$) = \$6.25, the collection
\$2500 − \$18.75 (\$12.50 + \$6.25) = \$2481.25, the proceeds

Problems

1. Find the proceeds of a 60-day sight draft for \$5000, if discounted at 6% on the day it is accepted; collection, $\frac{1}{8}\%$.

2. Find the proceeds of a 90-day sight draft for \$7500, sold at a discount of $\frac{1}{4}\%$ on the day it is accepted, money being worth 6%.

3. Find the proceeds of a 30-day sight draft for \$4000, sold at a discount of $\frac{1}{2}\%$ on the day it is accepted, money being worth 6%.

4. Find the proceeds of a 60-day sight draft for $6500, if discounted at 6% on the day it is accepted; collection, $\frac{1}{16}$%.

5. Find the proceeds of a 4 months' trade acceptance for $12,000, if discounted at 6% 4 days after it is accepted; collection, $\frac{1}{16}$%.

FOREIGN EXCHANGE

Foreign exchange is the sending of money or credits between one country and other countries having different monetary systems (different kinds of money). The object is usually the settlement of debts between merchants of one country and those of another.

Remittances may be made from one country to other countries by telegraphic transfers (cablegrams) or by actual shipment of specie (gold or silver). Most debts are settled, however, by a transfer of paper credit documents, authorizing money to be paid.

By whatever means the remittance or transfer is made, the exchange has to be reckoned in terms of the different monetary values.

The **bill of exchange** is one form of paper credit used instead of gold to settle debts abroad. Foreign exchange also uses such credit instruments as the **letter of credit** and the **travelers' check.**

The **bill of exchange** is a draft in form, payable on presentation or according to its terms.

A **documentary** bill of exchange is one to which documents, such as bills of lading, certifications, or invoices, are attached. These documents, whatever they may be, are turned over to the drawee when he pays or accepts the draft.

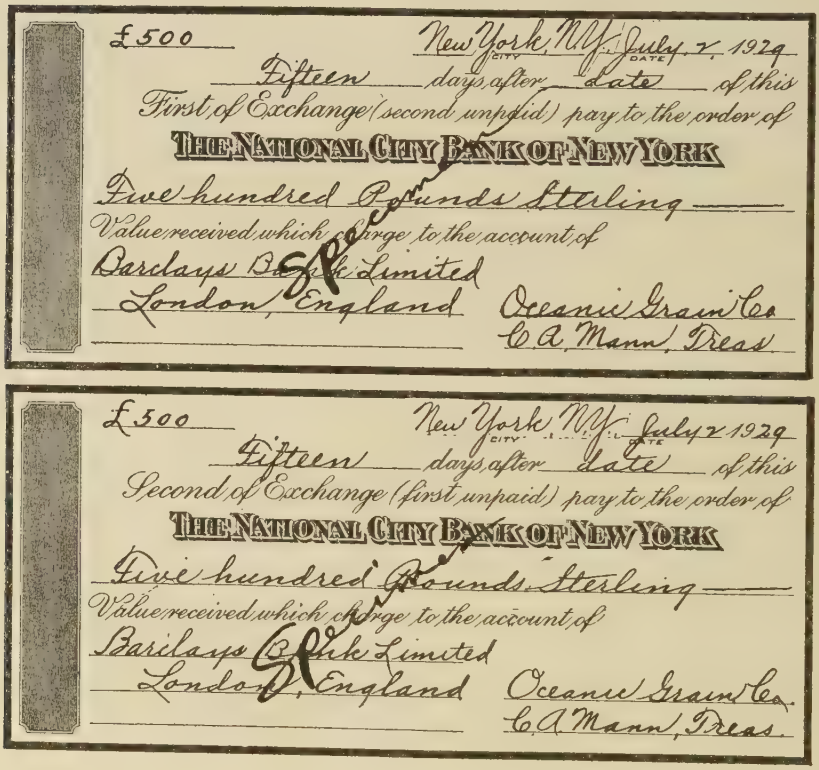
While foreign bills of exchange may be personal drafts, drawn by an individual or a firm, and collected through a bank, more often they are purchased from a bank in the same way as bank drafts, and are used for making remittances.

Bills of exchange issued by banks are orders drawn on a correspondent bank in another country. The one to whom the bill of exchange is sold sends it to the payee or endorsee (the one to whom he endorses it). The latter, when he receives it, will deposit it in a bank or have it cashed. It will eventu-

ally come back, as a canceled voucher, through the course of exchange, to the bank issuing it.

Formerly banks issued bills of exchange in sets of two or three. In this case, they were sent by different routes or at different times, so that if one got lost, the second or third of the series would reach its destination. On account of the safety of ocean transportation to-day, this practice of issuing sets of bills of exchange has been discontinued. Only in case a set of bills of exchange is asked for do some banks issue more than a single draft to-day.

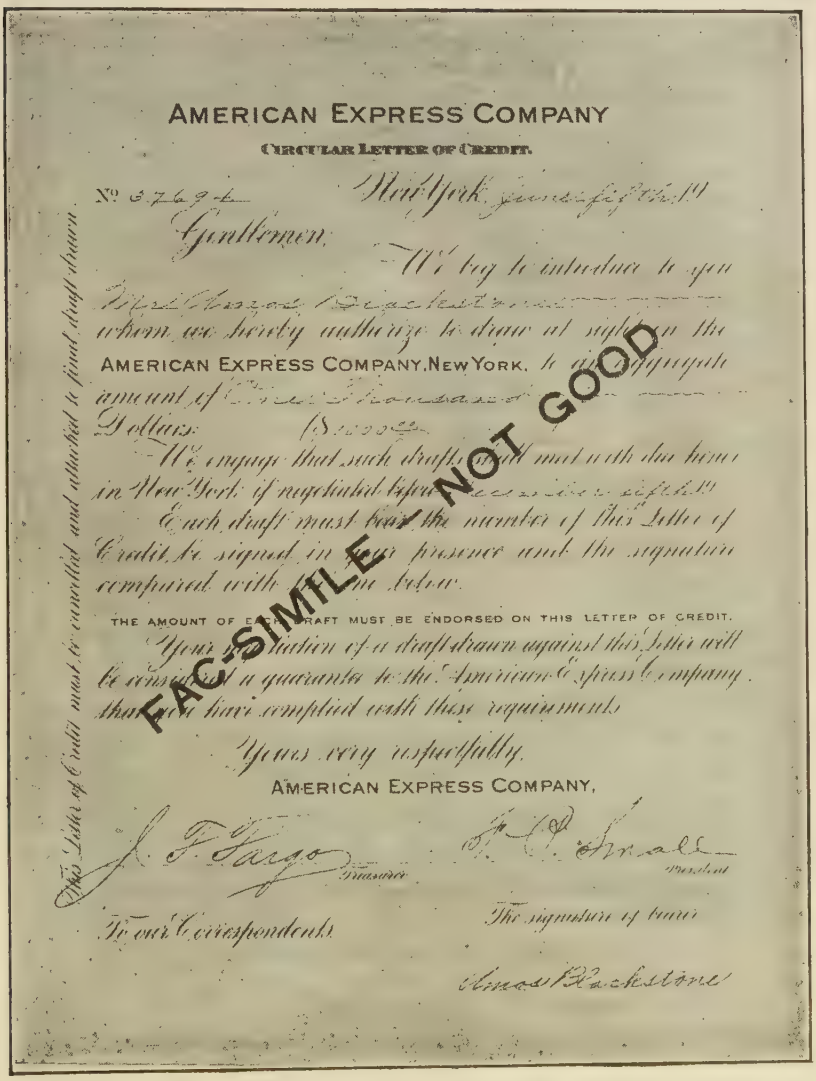
A sample set of bills of exchange follows:



Form 15.—Sample Set of Bills of Exchange.

A **cable transfer** is a very direct and quick means of effecting a transfer of exchange. Because of this, and the

fact that banks handle cable exchange transfers at a very reasonable rate, this means of exchange is becoming more generally used.



AMERICAN EXPRESS COMPANY

CIRCULAR LETTER OF CREDIT.

No. 37694 New York, June fifth 19

Gentlemen,

We beg to introduce to you Mr. Amos Blackstone whom we hereby authorize to draw at sight on the AMERICAN EXPRESS COMPANY, NEW YORK, to an aggregate amount of One Thousand Dollars ($1000.00)

We engage that such drafts shall meet with due honor in New York if negotiated before December fifth 19

Each draft must bear the number of this Letter of Credit, be signed in your presence and the signature compared with the one below.

THE AMOUNT OF EACH DRAFT MUST BE ENDORSED ON THIS LETTER OF CREDIT.

Your negotiation of a draft drawn against this Letter will be considered a guarantee to the American Express Company that you have complied with these requirements.

Yours very respectfully,

AMERICAN EXPRESS COMPANY,

J. F. Fargo, Treasurer. F. C. Small, President.

To our Correspondents. The signature of bearer

Amos Blackstone

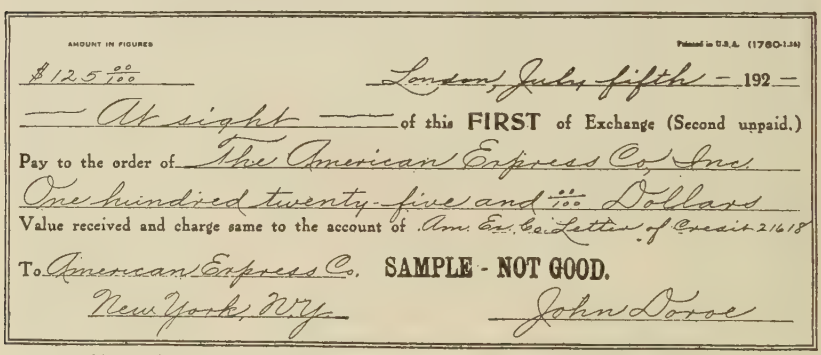
This Letter of Credit must be cancelled and attached to final draft drawn.

FAC-SIMILE—NOT GOOD

Form 16.—Letter of Credit.

A **letter of credit** is a credit instrument in the form of a letter issued by a bank, authorizing the one to whom it is issued to draw money on demand through banks in other countries or other parts of the same country. This is done by means of a draft, not to exceed the amount or the balance of the letter of credit, drawn against the bank issuing it and signed by the owner of the letter of credit. By a mutual agreement among banks, this draft will be cashed by many banks in different countries the world over. This is a great convenience to travelers, who by this means are relieved of the necessity of carrying a great amount of current funds with them when traveling. Express companies also issue letters of credit against which drafts are drawn and cashed at the express company offices in other sections or countries.

In the following illustration, John Doroe of New York has an American Express letter of credit, number 21618, for $1000. Upon his arrival in London, he presents this letter of credit at the London office of the American Express Company. A



AMOUNT IN FIGURES

$125 00/100

London, July fifth — 192 —

At sight of this FIRST of Exchange (Second unpaid.)

Pay to the order of The American Express Co. Inc.

One hundred twenty-five and 00/100 Dollars

Value received and charge same to the account of Am. Ex. Co. Letter of Credit 21618

To American Express Co. SAMPLE - NOT GOOD.

New York, N.Y.

John Doroe

Form 17.—American Express Company Letter of Credit Draft.

draft for $125 in currency, to meet his personal expenses, is given to him. A notation of this payment is then made upon the letter of credit. From time to time Doroe may draw other drafts up to the full amount of the letter of credit.

Foreign letters of credit are usually issued in English money, because the English pound sterling is readily negotiated in nearly every country.

The bank letter of credit draft is drawn through some other

bank against the issuing bank, whereas the express company letter of credit draft is drawn against the issuing office.

$100 00/100 — NEW YORK, N. Y. July 3, 1929

ON DEMAND PAY TO THE ORDER OF

THE NATIONAL CITY BANK OF NEW YORK

One hundred — DOLLARS

ON ACCOUNT OF LETTER OF CREDIT No. 1694 DATED June 5, 1929

ISSUED BY Merchants Trust and Savings Bank Chicago Ill.

To Chase National Bank New York, N.Y. — Adam D. Simpson

L.C. 23 ORIG. P.S.

Form 18.—Bank Letter of Credit Draft.

The **travelers' check** is another form of exchange issued by express companies and by banks. These checks are issued in denominations of $10, $20, $50, and so on. The foreign currency equivalents are printed on the face of the check. They are payable in any country where there are express offices or banks.

The following is an illustration of a travelers' check:

Form 19.—Travelers' Check.

Foreign Exchange Quotations

The four principal exchange centers in Europe are London, Paris, Rome, and Berlin.

The **par** of exchange means the equivalent value, in terms of the pure metal contained, of the monetary unit of one country as compared with the monetary unit of another country. For example: the pound sterling, the English

monetary unit, when compared with the monetary unit ($1) of the United States, in terms of the value of each in gold, is equivalent to $4.8665. This is, therefore, the par of exchange between these two countries. The monetary units of other countries are compared in the same way.

Rates of Exchange

The rates of exchange vary constantly from par, according as the money of one country is in greater or less demand to pay debts in the other country. Current exchange quotations are available from many daily papers and from banks. The rates obtaining when this was written were:

Sterling, par, $4.86\frac{5}{8}$ per sovereign[1]

Demand, $4.84\frac{9}{16}$; cables, $4.84\frac{11}{16}$
Commercial drafts, 60 days, $4.80\frac{11}{16}$
Sterling (England) rates of exchange vary by $.00$\frac{1}{16}$

Franc (France), par, $3.91\frac{3}{4}$¢ per franc
Demand, $3.90\frac{9}{16}$¢; cables, $3.90\frac{3}{16}$¢

Lira (Italy), par, 5.2631¢ per lira
Demand, $5.23\frac{1}{8}$; cables, $5.23\frac{3}{8}$

Mark (Germany), par, 23.8¢ per mark
Demand, 23.76¢; cables, 23.77¢

To find the cost of a bill of exchange.—

Example.—Find the cost of a bill of exchange for £240, 10s at $\$4.84\frac{9}{16}$.

10s = £$\frac{1}{2}$, or £.5; £240 + £.5 = £240.5
£240.5 × $\$4.84\frac{9}{16}$ = $1165.37, the cost

Problems

1. Find the cost of a bill of exchange for £264, 8s at par ($4.8665), plus a service charge of $\frac{1}{16}$%.

2. Find the cost of a bill of exchange for 12,000 francs at $3.90\frac{9}{16}$¢; commission, $\frac{1}{8}$%.

[1] The English gold coin.

3. Find the cost of a bill of exchange for 35,000 lire at 5.23$\frac{1}{8}$¢; commission, $\frac{1}{10}$%.

4. Find the cost of a bill of exchange for 8600 marks at 23.76¢; commission, $\frac{1}{4}$%.

5. Find the cost of a letter of credit for £300 at \$4.86$\frac{5}{8}$, the charge being 1%.

Example.—How many marks can be purchased for \$600 at 23.8¢, or 95.4¢ for 4 marks.

\$600 ÷ 95.4¢ = 630.2626, the number in terms of 4 marks
630.2626 × 4 = 2521.0504 marks

Problems

1. How many francs can be purchased for \$250 at 3.91$\frac{3}{4}$¢?

2. How many francs can be purchased for \$800 at 3.90$\frac{9}{16}$¢?

3. How many lire can be purchased for \$500 at 5.23$\frac{1}{8}$¢?

4. How large a draft on London can be purchased for \$1600 with exchange at \$4.84$\frac{9}{16}$?

5. How large a draft on Paris can be purchased for \$1200, with exchange at 3.90$\frac{9}{16}$¢?

General Problems

1. Find the cost of five travelers' checks for the following amounts: £10, £20, £20, £50, and £50; exchange, \$4.84$\frac{9}{16}$; commission, 75¢ per \$100 ($\frac{3}{4}$%).

2. A New York merchant owes a London merchant £285, 15s. What will a draft cost in New York, when exchange is \$4.875, and commission is $\frac{1}{16}$%?

3. How much will a draft for 28,000 lire cost at 5.2631¢ per lira, when commission is $\frac{1}{10}$%?

4. How many lire will a draft for \$1670 purchase at 5.23$\frac{1}{8}$¢ per lira?

5. A merchant wishes to remit \$2500 to Paris. (a) How many francs will the draft be issued for at 3.90$\frac{9}{16}$¢ per franc? (b) Find the cost, if the commission is $\frac{1}{16}$%.

SETTLEMENT OF ACCOUNTS

Accounts are usually settled by the debtor paying to the creditor the balance of the account. But it sometimes happens that there are in an account a number of charges, or items, entered on different dates. It is then necessary to find

a time when settlement may be made without loss to either debtor or creditor. This process is known as finding the **equated date.**

The equated date is the date on which the account may be settled without any loss of interest to the debtor or to the creditor. ("Equated" means "equal.")

Accounts on One Side of the Ledger

Accounts may have only one side, that is, all the items may appear either on the credit or debit side of the account. On the creditor's books such an account would stand as follows:

EDWARD J. ELLSWORTH

1929										
Jan.	10	To Mdse.	600							
Jan.	25	To Mdse.	900							
Feb.	18	To Mdse.	1200							

In this account Mr. Ellsworth is charged with three amounts. It is evident that he has purchased merchandise on three different dates and has been charged with the amount of each purchase. He has paid nothing on account, and for whatever time these amounts remain unpaid the creditor loses the interest.

Let us assume that the creditor in this case is L. C. Baker & Co. On Mr. Ellsworth's books the creditor's account would then stand as follows:

L. C. BAKER AND COMPANY

					1929					
					Jan.	10	Mdse. Purchased	600		
					Jan.	25	Mdse. Purchased	900		
					Feb.	18	Mdse. Purchased	1200		

To find the equated date in an account.—

Example.—Find the date when the preceding account may be settled without loss to either party.

To equate this account for the creditor, we find the date on which it should have been paid in full without loss to either debtor or creditor.

In solving this problem, it is necessary to use a **focal date.** The focal date is the date from which, or to which, the time is reckoned, depending on whether it is the earliest or the latest date. When the latest date is used, count back to find the equated date; and when the earliest date is used, count ahead. Either the earliest due date or the latest due date may be taken as the focal date. The latest date is used here.

The focal date is Feb. 18 (the latest date).

The product method.—

\$ 600 × 39 days (Jan. 10 to Feb. 18) = \$23,400 for 1 day
900 × 24 days (Jan. 25 to Feb. 18) = 21,600 for 1 day
1200 × 0 (the focal date) = 000

\$2700 for the full time = \$45,000 for 1 day
\$45,000 ÷ \$2700 = $16\frac{2}{3}$ or 17 days approximately

(The interest on \$45,000 for 1 day is equal to the interest on \$2700 for $16\frac{2}{3}$ days.)

Counting back 17 days from Feb. 18 gives us Feb. 1. In order to settle this account without loss to either party, Mr. Ellsworth should pay the account in full and the interest, at the usual rate, on \$2700 for 17 days.

The time from Jan. 10 to Feb. 18 is 39 days. Now, \$600 multiplied by 39 days gives 23,400, which is equal to \$23,400 for 1 day. (If \$600 were placed at interest for 39 days, the interest would be the same, at the same rate, as the interest on \$23,400 for 1 day.) The time from Jan. 25 to Feb. 18 is 24 days. Then, \$900 multiplied by 24 days gives 21,600, which is equal to \$21,600 for 1 day. The \$1200 is on the focal date, and there is nothing by which to multiply. The total of the account is \$2700, and the total for 1 day is \$45,000. Dividing 45,000 by 2700, the result is $16\frac{2}{3}$, or 17 days. The nearest even number of days is always taken; therefore, the time would be 17 days. Count-

ing back 17 days from Feb. 18 gives Feb. 1 as the equated date, or the date from which interest should be reckoned on the balance of the account.

Problems

Find the equated date in each of the following accounts. When necessary, first find the due date of each item.

1. D. W. Howard

1929											
Mar.	5	To Mdse.	350								
Apr.	2	To Mdse.	860								
May	1	To Mdse.	400								

2. C. H. Cooper

1929											
Jan.	14	To Mdse. 30 days	750								
Feb.	11	To Mdse. 30 days	930								
Mar.	12	To Mdse. 30 days	1280								

3. O. E. Thomas

1929											
Apr.	2	To Mdse. 60 days	750								
May	7	To Mdse. 60 days	1200								
June	4	To Mdse. 30 days	1500								

4. L. H. Jackson

1929											
June	3	To Mdse. 30 days	840								
June	27	To Mdse. 60 days	915								
July	22	To Mdse. 60 days	1230								

The interest method.—The method used in solving the preceding problems is known as the **product method.** Another method which may be used is the **interest method.**

Example.—On what date may the following account be settled in full without loss of interest to either party?

A. J. Hofmann

1929			
Jan.	2	Mdse. 30 days	600
Jan.	28	Mdse. 60 days	800
Feb.	25	Mdse. 60 days	1500
			2900

Jan. 2 + 30 days = Feb. 1, the due date
Jan. 28 + 60 days = Mar. 29, the due date
Feb. 25 + 60 days = Apr. 26, the due date

The latest date, or the focal date, is Apr. 26

$600 at 6% for 84 days = $8.40, the interest
$800 at 6% for 28 days = 3.73, the interest
$1500 at 6% for 0 days = 00
$12.13

The interest on $2900 for 1 day at 6% = $.483
$12.13 ÷ $.483 = 25+, or 25 days
Apr. 26 − 25 days = Apr. 1, the equated date

If money is worth 6% interest, to settle this account equitably Mr. Hofmann would have to pay the creditor $2900 plus the interest from Apr. 1 to the date of settlement.

Problems

On what dates may the following accounts be paid in full without loss of interest to either debtor or creditor? (Solve by the interest method.)

1. R. H. Stenson

1929			
Mar.	4	Mdse. 60 days	1250
Apr.	2	Mdse. 60 days	1460
May	1	Mdse. 60 days	940

2. W. H. Coles

1929			
June	3	Mdse. 30 days	1620
July	8	Mdse. 30 days	1840
Aug.	5	Mdse. 30 days	2130

3. D. W. Henderson

1929											
May	14	Mdse. 60 days	360								
June	11	Mdse. 60 days	540								
July	15	Mdse. 60 days	1020								

4. J. C. Emerson & Co.

1929											
Apr.	8	Mdse. 30 days	2580								
May	20	Mdse. 60 days	3300								
June	10	Mdse. 90 days	2750								

Accounts on Both Sides of the Ledger

Thus far we have been dealing with accounts having items on one side of the ledger only. The problems are equations of payments by a customer to his creditor.

The following accounts have items on both sides, and the problems are equations of accounts.

In finding the equated date, either the product method or the interest method may be used.

Example.—Find the equated date for the following account:

M. E. Everett

1929											
Jan.	7	Mdse.	1200			Feb.	6	By Cash	900		
Feb.	4	Mdse.	1500			Mar.	5	By Cash	1200		
Mar.	11	Mdse.	1800								
			4500						2100		

Solving by the product method.—

Mar. 11 is the focal date

Dr.

\$1200 × 63 days (Jan. 7 to Mar. 11) = 75,600 for 1 day
1500 × 35 days (Feb. 4 to Mar. 11) = 52,500 for 1 day
1800 × 0 = 000
4500 for the full time = 128,100 for 1 day

Cr.

\$900 × 33 days (Feb. 6 to Mar. 11) = 29,700 for 1 day
1200 × 6 days (Mar. 5 to Mar. 11) = 7,200 for 1 day
2100 for the full time = 36,900 for 1 day
\$4500 − \$2100 = \$2400, the balance of the account
\$128,100 − \$36,900 = 91,200, the balance for 1 day
\$91,200 ÷ \$2400 = 38, the no. of days
Mar. 11 − 38 days = Feb. 1, the equated date

To settle the balance of this account equitably Mr. Everett will have to pay interest on \$2400 from Feb. 1 till the date of settlement.

Solving by the interest method.—

By the interest method the solution is as follows:
Use the same focal date, Mar. 11

Dr.

\$1200 at 6% for 63 days = \$12.60 interest
1500 at 6% for 35 days = 8.75 interest
1800 at 6% 0 = 00
\$4500 \$21.35

Cr.

\$900 at 6% for 33 days = \$4.95 interest
1200 at 6% for 6 days = 1.20 interest
\$2100 \$6.15
\$4500 − \$2100 = \$2400, the balance of the account
\$21.35 − \$6.15 = \$15.20, the balance of interest
\$2400 at 6% for 1 day = \$.40
\$15.20 ÷ \$.40 = 38, or 38 days
Mar. 11 − 38 days = Feb. 1, the equated date

Problems

Find the equated date of payment of the balance of the following accounts:

Solve problems 1 and 2 by the product method.

1. T. M. Mead & Co.

1929					1929				
Jan.	14	Mdse.	1700		Feb.	14	Cash	1200	
Feb.	6	Mdse.	1840		Mar.	1	Cash	1500	
Mar.	12	Mdse.	2300						

2. R. E. Olson & Co.

1929					1929				
Mar.	6	Mdse. 30 days	540		Apr.	4	Cash	400	
Apr.	10	Mdse. 30 days	680		May	1	Cash	700	
May	9	Mdse. 30 days	720						

Solve the following problems by the interest method:

3. Martin & Green

1929					1929				
June	3	Mdse. 60 days	2400		July	1	Cash	2000	
July	9	Mdse. 60 days	2750		Aug.	1	Cash	3000	
Aug.	6	Mdse. 60 days	3240						

4. C. W. Hawley & Co.

1929					1929				
Aug.	5	Mdse. 60 days	3600		Oct.	5	Cash	3000	
Sept.	2	Mdse. 60 days	4200		Nov.	2	Cash	4500	
Oct.	1	Mdse. 60 days	4800						

Rule for counting from the focal date.—

When to count back or ahead from the focal date:

1. *Count back from the focal date when the balance of the account and balance of the interest are on the same side of the account; both on the debit or left side or both on the credit or right side.*

2. *Count ahead when the balance of the account and the balance of the interest are on opposite sides of the account; that is, if the balance of the account is on the debit or left side of the account and the balance of the interest is on the credit or right side; or, if the reverse is the case.*

5. Equate the following account, using the interest method:

C. D. Fisher

1929					1929				
June	5	Mdse. 30 days	1200		June	20	Cash	1200	
July	2	Mdse. 60 days	1500		July	8	Cash	1500	
Aug.	1	Mdse. 60 days	1800		Aug.	10	Cash	900	

6. Solve the preceding problem, using the product method.

CASH BALANCES

The **cash balance** of an account is the amount of cash that will pay the account in full on a given date. If interest is charged on overdue items, then the cash balance must include the interest.

To find the cash balance of an account when the interest rate is given.—

Example.—Find the cash balance of the following account on April 1, 1929, if interest at 6% is allowed on all items.

A. E. HAINES

1929					1929				
Jan.	2	Mdse. 30 days	740		Feb.	1	Cash	600	
Feb.	4	Mdse. 30 days	665		Mar.	2	Cash	500	
Feb.	14	Mdse. 30 days	925						

Count the time from the due dates of the items.

Interest on Debit Items

$ 740 at 6% for 59 days (Feb. 1 to Apr. 1) = $ 7.28 interest
665 at 6% for 26 days (Mar. 6 to Apr. 1) = 2.88 interest
925 at 6% for 16 days (Mar. 16 to Apr. 1) = 2.47 interest

$2330 $12.63

Interest on Credit Items

$ 600 at 6% for 59 days (Feb. 1 to Apr. 1) = $ 5.90 interest
500 at 6% for 30 days (Mar. 2 to Apr. 1) = 2.50 interest

$1100 $ 8.40

$2330 − $1100 = $1230. the balance of the account
$12.63 − $8.40 = $4.23, the balance of the interest
$1230 + $4.23 = $1234.23, the cash balance

or

($2330 + $12.63) − ($1100 + $8.40) = $1234.23, the cash balance.

The debit items, plus the debit interest, minus the credit items, plus the credit interest gives the cash balance.

To find the cash balance of an account when interest is allowed, charge the interest on all overdue items to the account and credit the account with the interest on all items paid before they are due. The balance of the account will be the cash balance.

Problems

Find the cash balance of the following accounts as directed:

1. L. M. Swift & Co.

1929					1929				
Mar.	11	Mdse. 30 days	1180		Apr.	10	Cash	1000	
Apr.	4	Mdse. 30 days	790		May	6	Cash	600	
May	1	Mdse. 30 days	1512						

Find the cash balance on July 1, allowing interest at 6%

2. The Blake Company

1929					1929				
Jan.	7	Mdse. 60 days	1440		Mar.	8	Cash	1200	
Feb.	5	Mdse. 60 days	1280		Apr.	6	Cash	1000	
Mar.	6	Mdse. 60 days	870						

Find the cash balance on May 31, allowing interest at 6%

3. Horace H. Porter

1929					1929				
Apr.	1	Mdse. 60 days	970		June	1	Cash	700	
May	8	Mdse. 30 days	1360		June	5	Cash	1500	
June	30	Mdse. 10 days	852						

Find the cash balance on July 15, allowing interest at 6%

PARTNERSHIP SETTLEMENTS

A **partnership** is an association, or an organization, of individuals resulting from an agreement whereby they are to conduct some business and to share in the profits or to bear the losses resulting therefrom.

The profits may be shared equally, in proportion to the amount invested by each partner, in proportion to the average investments, or in any other way agreed upon by the partners. In the absence of a definite stipulation in the agreement, it is

usually understood that the partners will share the profits equally. Several arrangements are common:

1. Each partner may draw a salary; or
2. Interest at a definite rate may be allowed on each partner's investment, after which the profits may be divided equally; or
3. The profits may be divided pro rata according to the investments.

Sometimes additional investments are made, and at other times withdrawals are made by the partners. Accumulated profits are very often used to increase the investments of the partners. The losses decrease each partner's profits or investments, unless the former are provided for by a reserve fund or covered by an additional investment.

In case of dissolution of the partnership, the assets are usually distributed according to the agreement. After the debts of the partnership have been paid, the remaining assets are converted to the partners. Each partner will receive, first, all amounts he has loaned or advanced to the partnership. Second, he will receive the amount of his original investment in full if the assets are sufficient; otherwise, he will receive his pro rata share. The remaining assets, if there are any, are usually apportioned in the same way in which the profits have been apportioned.

The problems in partnership settlements have to do with finding each partner's share of the profits or losses and each partner's net worth, and with dividing the assets proportionately at the time of dissolution.

Net worth, or **proprietorship,** is the amount of any partner's net assets at any given time.

The **capital** of a partnership is the money and all other forms of property invested in the business.

The **resources** of a partnership include all forms of property which belong to the partnership and all obligations which others owe to the same.

The **liabilities** of a partnership consist of its debts or obligations to others.

To find each partner's share of the profits according to the amount of his investments.—

Example.—H. and M. invested \$8000 each in a coal and oil business. The first year they gained \$3780. Find each partner's share of the gain.

$\$8000 + \$8000 = \$16{,}000$, the total investment

$\$3780 \times \frac{1}{2}\left(\frac{8000}{16{,}000}\right) = \$1890$, each partner's share of the gain

Problems

1. Martin and Henderson invested \$20,000 each in a lumber business. The net profit during the first year was \$9200. Find each partner's share of the profit.

2. Rice and Moore invested \$15,000 each in a hardware business. During the first year their net loss was \$2640. During the second year their net gain was \$5620. Find each partner's present worth at the end of the second year. (The present worth is the net investment plus the net gain.)

3. Howard and Long invested \$7500 each in a grocery business. At the end of three years their resources amounted to \$24,650 and their liabilities totaled \$3930. Find each partner's share of the profits. (The total resources minus the total liabilities equals the firm's present worth. The firm's present worth minus the total net investment equals the net profit.)

4. Three partners invested \$12,000 each in a furniture business. Each partner drew a salary of \$200 per month, which was deducted from the profits. The remaining profits were to be divided equally. At the end of two years the firm's resources amounted to \$56,420 and its liabilities amounted to \$8360. (a) Find the net profit of the firm at the end of the two years. (b) Find the total profit for the two years. (c) Find each partner's share of the net profit.

5. *A* invested \$7500, *B* invested \$12,500, and *C* invested \$15,000 in a trucking business. Each partner drew a salary of \$150 per month. The net gain, according to their agreement, was to be shared in proportion to their investments. At the end of the first year, after each partner had drawn his full salary, the net gain was \$5628. Find each partner's share.

6. The resources of a partnership are: cash, \$4640; merchandise inventory, \$8950; accounts receivable, \$7320; and notes receivable, \$2570. The liabilities are: notes payable, \$2000; and accounts payable, \$3740. The two partners invested \$7000 each. (a) Find each partner's present worth. (b) Find each partner's net profit.

7. Allen, Frasier, and Knapp are partners in conducting a department store. Allen invested \$20,000; Frasier invested \$25,000, and Knapp invested \$35,000. Their agreement provides that each partner shall be paid from the net profits at the rate of 6% per annum on his net investment,

after which any profits remaining are to be divided equally. Losses are to be shared in proportion to net investments. The profit and loss statement at the end of the year showed a net profit of $12,840, before the interest on the respective investments was credited to each partner's account. Find each partner's share of the net profit, including the interest on his investment.

8. In the above problem, if the net profit for the year had been only $3600, what pro rata share should each partner have drawn as his part of the interest on his investment?

To find the profits of each partner according to average investments.—

When investments are made by the partners in different amounts at different times, it is the practice to apportion the interest, and the profits or losses, according to the average investments.

Example.—*A* and *B* are partners in conducting a public garage and automobile service station. On July 1, *A* invested $4000, and *B*, $3000. On Nov. 1, *A* invested $1000 additional, and *B*, $1500. On March 1, *A* withdrew $500. On April 1, each partner invested $1000 additional. The net profit for the year was $2736. Find each partner's share in proportion to his average investment.

A's Investment

$4000 for 4 mo. is equal to $16,000 for 1 mo.
5000 for 4 mo. is equal to $20,000 for 1 mo.
4500 for 1 mo. is equal to $ 4,500 for 1 mo.
5500 for 3 mo. is equal to $16,500 for 1 mo.

Total investment is equal to $57,000 for 1 mo.

$57,000 ÷ 12 mo. = $4750, A's average investment

B's Investment

$3000 for 4 mo. is equal to $12,000 for 1 mo.
4500 for 5 mo. is equal to $22,500 for 1 mo.
5500 for 3 mo. is equal to $16,500 for 1 mo.

Total investment is equal to $51,000 for 1 mo.

$51,000 ÷ 12 = $4250, B's average investment
$4750 + $4250 = $9000, the total average investment
$\frac{4750}{9000} \times \$2736 = \$1444$, A's share of the profits
$\frac{4250}{9000} \times \$2736 = \$1292$, B's share of the profits

To find the average investment of two or more partners.—

1. *Find the total investment for the periods of time, in days, months, or years.*

2. *Divide the total investment by the units of time, using* 365 *days,* 12 *months, or the number of years. The quotient is the average investment.*

Usually months are taken for the periods of time; for, as a rule, change in investments takes place at intervals of months, or at periods approximating them so nearly that months are used. If investment changes take place at irregular intervals, it is neccessary to use days as the periods of time.

Problems

1. *G* and *H* are partners in conducting a chain of ten grocery stores. On April 1, *G* invested \$25,000, and *H* invested \$20,000. On July 1, *G* invested \$5000 additional, and *H* invested \$10,000 additional. On October 1, *G* withdrew \$2000, and *H* withdrew \$1000. The profit and loss statement for the year showed a net profit of \$8212.50. Find each partner's share according to his average investment for the 12 months.

2. Madison and Moore are partners in a plumbing business. On May 1, Madison invested \$9000, and Moore invested \$6000. On November 1, Madison invested \$1000 additional, and Moore invested \$1500 additional. Each partner drew a salary of \$125 a month, and interest at 6% is to be allowed on each partner's average investment. After all expenses and salaries are paid, the net profit for the year, including the interest on each partner's investment is \$3981.25. Find each partner's present worth.

3. Adams and Fink engaged in a taxicab business. On July 1, Adams invested \$3500, and Fink, \$2500. On November 1, each partner invested \$500 additional. On February 1, Adams withdrew \$1000. At the end of the year the assets were converted to cash and the partnership was dissolved. If the assets amounted to \$3750, how much was each partner's share according to his average investment?

4. On January 1, M. E. Kirk and J. E. Marsh engaged in the automobile accessory business. Kirk invested \$15,000, and Marsh invested \$20,000. Each partner is to receive 8% interest on his investment, and the net profit is to be divided according to the average investments. On July 1, each partner invested \$2500 additional. The profits for the year, before the interest on the investments was deducted, were \$10,125. (a) Find each partner's share of the profits. (b) Find each partner's present worth, including the interest on his investment.

5. Baker and Brown engaged in the flour and feed business. On April 1, each partner invested \$7500. On July 1, Lowery was admitted as a partner

with an investment of $10,000, and each of the old partners increased his investment $2500. At the end of the year the assets of the firm amounted to $55,312.50 and their liabilities were $16,125. Find each partner's share of the profits according to his average investment.

GRAPHS

Graphs are used to present statistical data in a form which makes it possible to interpret more readily certain facts contained in the data, and to draw conclusions in a comparative way from these facts as presented.

A graph represents pictorially the relation between two units of measure, that is, quantity with reference to time; value with reference to quantity; the parts with reference to the whole and with reference to each other, and so on.

The following graphs are used to show proportions of parts to the whole, and to show the relation of one part of a group to other parts of the same group: the **straight line, parallel lines,** or **bars**; the **rectangle**; and the **circle.**

While these are the ones most commonly used, any figures may be employed by which relative values are shown by the different sizes of the figures.

Graphs used to show fluctuations or changes in a series of similar facts over a period of time are: the **single curve,** and **multiple comparative curves.**

Illustration A—Bar Graph

This illustration represents a lumber dealer's sales for six years, 1923 to 1928, inclusive. From the zero point the two series of units, time in years and amounts in dollars, are arranged in progression, the amounts progressing from zero upward along the perpendicular line, and the time progressing from zero to the right along the horizontal line. The **time key**

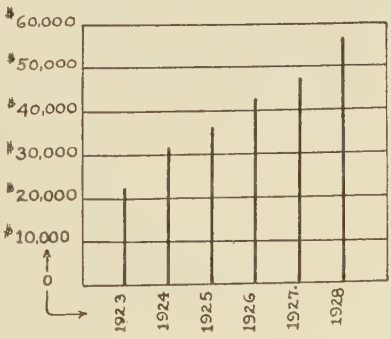


Fig. 33.

is one year, and the **amount key** is each horizontal section representing $10,000.

Questions

Referring to illustration A:

1. What are the two units of measure?
2. How much were the sales for 1924?
3. How do the sales for 1925 compare with those for 1928?
4. How much were the sales (a) for each year? (b) For the six years?
5. What was the per cent of increase in the sales for 1928 over those for 1923?
6. Why is it necessary to have a key to a graph?

Illustration B—Bar Graph

This illustration of a bar graph shows sales in thousands of dollars in the departments of a store for a single year.

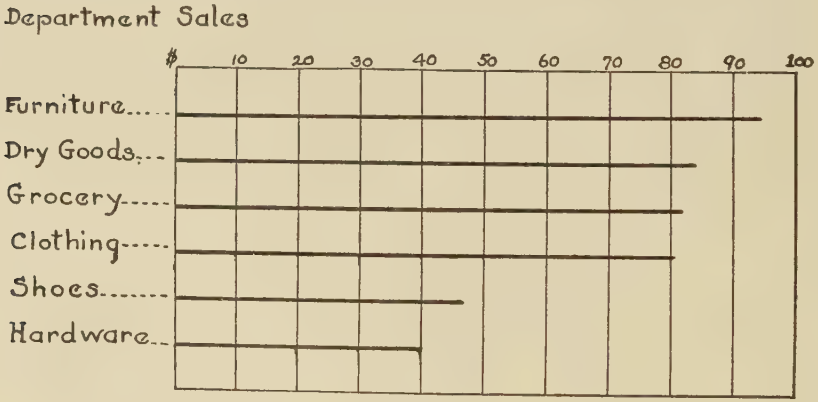


Fig. 34.

Questions

1. What is the difference between illustration A and illustration B?
2. What is the key in illustration B?
3. What do the horizontal lines represent?
4. What do the perpendicular divisions represent?
5. How do the sales in the hardware department compare with those in the furniture department?

Illustration C—Block Graph

This illustration of a block graph shows appropriation, by Congress for the years 1917 and 1927.

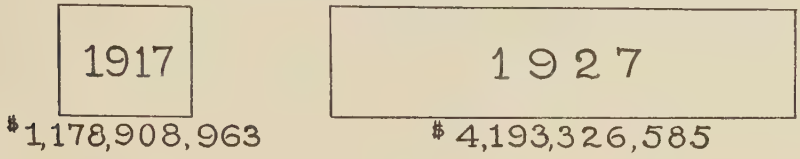


Fig. 35.

Questions

1. How much greater were the appropriations for 1927 than for 1917?

2. What was the average yearly increase in the appropriations over a period of ten years?

Illustration D—Rectangle Graph

This illustration of a rectangle graph shows the percentages of various items in the gross operating cost of a manufacturing plant for the year 1929. The operating cost was $580,000, distributed as follows: advertising, 12½%; raw material, 25%; labor, 37½%; rent and replacements, 10%; supplies, 2½%; management, 6½%; dividends 6%. (In the graph one-half inch represents 25%.)

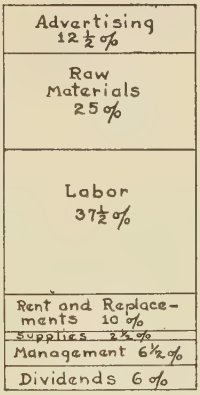


Fig. 36.

Question

Find the amount of each item shown in the graph.

Illustration E—Circle Graph

The circle graph illustrated on p. 250 shows the percentages of various items in a family's income. The family income of $4000 was distributed as follows: rent, 20%; food, 20%; clothing, 10%; fuel and light, 5%; church and gifts, 10%;

doctor and dentist, $2\frac{1}{2}\%$; vacations and amusements, 5%; insurance and savings, 20%; sundries, $7\frac{1}{2}\%$.

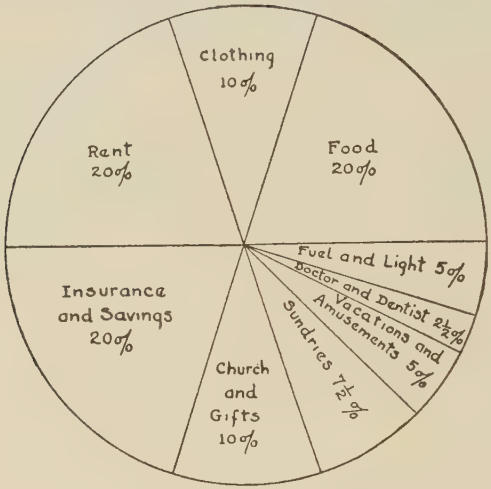


Fig. 37.

Question

Find the amount apportioned to each item.

Illustration F—Curve Graph

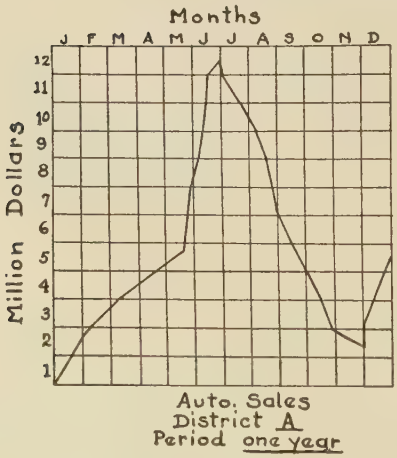


Fig. 38.

This illustration of a curve (broken line) graph shows the fluctuation of automobile sales over a period of one year in a certain territory, or district. The sales range from $1\frac{3}{4}$ millions in January to $11\frac{1}{2}$ millions in June.

Each perpendicular section represents one million dollars, and each horizontal section represents one month of time.

Questions

1. Read the graph and give the approximate sales for each month of he year.

2. Explain how the key is used in reading the graph.

Illustration G—Comparative Curves Graph

The comparative curves graph shown in this illustration respresents the relative amounts of collections and sales during

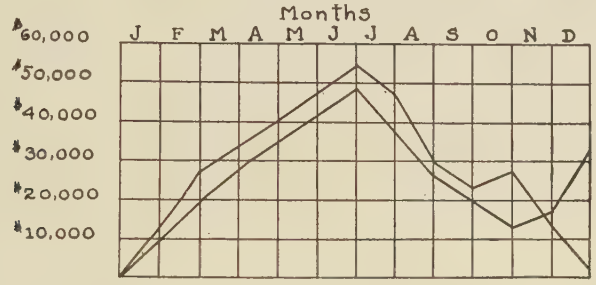


Fig. 39.

each month of a year in a certain business. The upper curve represents sales and the lower curve, collections.

It can be seen from the graph that the collections run a little behind the sales month after month until December, when the collections run ahead of the sales.

Questions

1. About how much were the sales each month?

2. About how much were the collections each month?

Problems

1. The sales of a department store for the year were as follows: groceries, $58,400; shoes, $63,200; clothing, $73,500; furniture, $81,000; dry goods, $83,200; rugs and carpets $96,000. Show by a bar graph the comparative sales in the six different departments. Place the longest line first and follow in regular order. (Compare fig. 34.)

2. The sales department showed sales for the year made by different salesmen as follows:

J. H. Harris	$29,400	H. J. Moore	$63,700
O. E. Jackson	52,900	A. D. Evans	38,000
L. M. King	48,700	R. E. Hines	71,500

Show by a bar graph the comparison of sales by the different salesmen.

3. Embezzlement insurance losses in the United States over a period of ten years were as follows:

1917	$ 1,921,388	1922	$ 9,308,503
1918	$ 2,472,385	1923	$10,311,258
1919	$ 3,704,717	1924	$12,141,011
1920	$ 4,406,923	1925	$13,033,417
1921	$ 8,672,024	1926	$14,038,009

Prepare a bar graph to show the relative increase year by year.

4. The earnings and expenses of a certain utility corporation over a period of six years are given in fig. 40.

	1923	1924	1925	1926	1927	1928
Earnings	380,000	470,000	550,000	625,000	750,000	900,000
Expenses	310,000	390,000	420,000	500,000	600,000	720,000

Fig. 40.

Prepare a comparative curves graph to show the relation between earnings and expenses.

5.

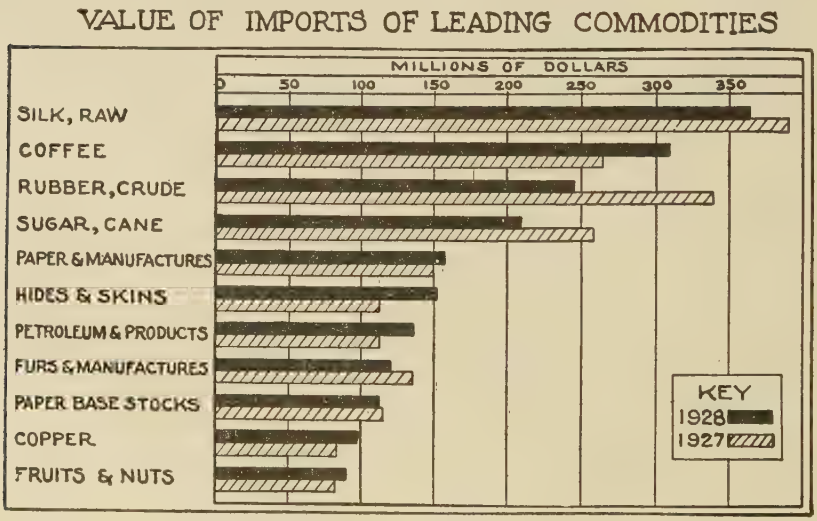


Fig. 41.

Prepare a schedule showing the comparison between the imports of the United States for 1927 and 1928.

SOME SPECIFIC APPLICATIONS OF BUSINESS ARITHMETIC

Annuities

An **annuity** is a sum of money deposited or paid regularly at the beginning of stated periods, for a definite purpose. The term is often applied to an investment designed to bring in an annual fixed income. The best examples are: life insurance premiums, deposits in interest accounts in banks, and shares in building and loan associations. All these investments bring a definite income regularly to the investor or depositor.

In solving the following problems, make use of the interest tables on pp. 167 and 168.

Problems

1. The annual premium on a life insurance policy for $2000 is $76.40. If we allow 4% compound interest on the premiums paid for a period of 15 years, what is the value of the premiums at the end of this time?

2. A man invested $1000 each year for 6 years. If his investments earn 5% compound interest annually for this time, how much are they worth at the end of the sixth year?

3. A man subscribed for 20 shares in a building and loan association. He paid in $20 a month for 6 years. He was allowed 4% compound interest per annum on the balance of his account every six months. What was the balance of this account at the end of the six years?

4. On a 20-year endowment policy for $4000, the premium is $200.60. If the insurance company keeps investing the premiums at 5% compound interest as fast as they are paid in, how much will they amount to at the end of the 20 years?

5. D. W. Harris and Company borrowed $12,000 at 6%. Find what annuity will discharge this debt in 6 years, if the payments are made annually, beginning at the end of the first year. (Divide the amount of the debt at 6% compound interest for the 6 years by the amount of $1 invested annually for 5 years plus $1 which draws no interest, paid at the beginning of the sixth year. Then $5.975318, the amount of $1 invested

annually for 5 years, plus \$1 equals \$6.975318, the amount by which to divide.)

6. (a) In the preceding problem, what annual annuity will discharge this debt in 10 years? (b) What amount of interest was paid during this time?

Amortization

Amortization is the paying off of a debt in equal payments at regular intervals, the payments covering both the original debt and the interest.

To find the amount which must be paid at stated intervals in order to amortize a debt.—

Example.—A man borrowed \$3000 from a building and loan association. He agreed to pay 6% interest annually and to pay the loan and interest in full in 5 equal annual payments. How much should he pay each year? (It is necessary to find what periodical payment will, in 5 years at 6%, equal a debt of \$3000 at 6%.)

The compound interest on \$1 invested at the beginning of the second, third, fourth, and fifth years amounts to \$4.637093. This sum plus the last \$1, which draws no interest = \$5.637093. Now, \$1 at compound interest for 5 years at 6% amounts to 1.3382256. This amount multiplied by 3000 gives 4014.6768000, the amount of \$3000 at 6% compound interest for 5 years. Then 4014.6768000 ÷ 5.637093 = \$712.189, the amount of each annual payment.

Proof.—\$3000 at 6% for 1 year = \$180 interest. Then \$3000 + \$180 − \$712.189 = \$2467.811, the balance after the first payment. Now, \$2467.811 at 6% for 1 year = \$148.06866. Therefore, 2467.811 + \$148.06866 − \$712.189 = \$1903.69, the balance after the second payment. Continue the calculation in this way. It will be found that, after the last payment, there will be no balance. (Dropping the odd mills less than 5 or adding the odd mills more than 5 will vary the result in the proof by a few cents.)

Problems

1. J. W. Calvin bought a house and lot for $12,000. He paid $2000 cash, and gave a first mortgage for $6000. He agreed to pay off in full the second mortgage of $4000, with interest at 6%, in 6 equal annual payments. Find the amount of each payment on the second mortgage.

2. A merchant secured a loan of $2000, at 6% for 3 years, on his stock of goods. He agreed to pay this loan in three equal annual payments. Find the amount of each payment.

3. A shoemaker installed in his shop modern machinery for which he agreed to pay $1200, with interest at 6%, in three equal annual payments. Find the amount of each payment.

4. Machinery costing $40,000 was bought on the installment plan by paying $10,000 cash, and $30,000 with interest at 6% in five equal annual payments. Find the amount of each payment.

Sinking Funds

A **sinking fund** is created by setting aside, each year for a period of years, such a sum of money that, with compound interest thereon, the total will be sufficient at the end of a fixed period to pay a certain debt or to provide a fund for a certain purpose.

When a sinking fund is created to pay a certain debt, it is understood to be the principal debt, for any interest is expected to be paid periodically during the time the debt is unpaid.

In solving the following problems, use the compound interest table found on pp. 167–168.

Problems

1. What sum will have to be put aside each year, at 5% compound interest, to redeem $50,000 in bonds at the end of 10 years? (Divide $50,000 by the amount of $1 invested annually at 5% compound interest for 10 years.)

2. A corporation has outstanding $60,000 in bonds, due in 8 years. How much will have to be set aside each year, at 4% compound interest, to redeem these bonds when due, at their face value?

3. Find the amount which must be set aside annually, at 5% compound interest, as a sinking fund to pay $100,000 in bonds due in 20 years.

4. A railroad company borrowed $500,000 by issuing bonds due in 15 years. Find the amount which will have to be set aside annually, at 4% compound interest, to meet these bonds at maturity.

5. The Globe Improvement Company borrowed $75,000 by issuing sinking fund bonds at 5%, maturing in 20 years. How much will have to be set aside each year, at 5% compound interest, to redeem the bonds at maturity? (By a "sinking fund bond" we understand that the issuing company agrees to create a sinking fund with which to pay these bonds at maturity.)

Building Loans

Building and loan associations are corporations chartered under the laws of the state in which they do business, for the purpose of financing the buying or building of homes. This is done by selling shares of stock to members, and loaning the money received from these sales to other members who wish to buy or build houses. The shares bought pay interest and are due to be redeemed at a stated time.

A member of an association subscribes for a certain number of shares, for which he agrees to pay a certain amount per week or month until they are paid for in full. A member who withdraws before he has paid his shares in full may receive a refund of all he has paid in and a portion of the profits, depending on the income and the rules of the association.

Only members are, as a rule, permitted to borrow money from the association. No member may borrow more than the par value of the shares he owns, and he is required to pay interest at the usual rate for what he borrows.

Building and loan associations, as a rule, operate under one of two plans:

1. By the first plan, the shares are issued and sold as a series. When all the shares in a particular series have been sold, there are no more to be had until a new series is issued. Anyone buying shares in a series at some time after it has been issued will have to pay the back dues and the earnings accrued. The shares in a single series all mature, that is, are due to be redeemed by the association, at the same time.

2. Another plan is to permit members to buy shares at any time. Each sale of shares then becomes a series by itself.

When the shares mature, the owner may withdraw their cash value, or if the association can loan the money, he may accept a certificate for his shares and receive a semiannual cash dividend.

The two classes of stockholders in an association are the **investors,** who buy the stock and receive the interest thereon; and the **borrowers,** who borrow the money and pay interest thereon.

The three kinds of shares which stockholders may buy are **installment shares; accumulative prepaid shares;** and **income,** or **investment shares.**

1. Installment shares are shares for which the regular weekly or monthly dues are paid by the subscriber until they mature, or until they are withdrawn at whatever cash value they may have at the time of their withdrawal. When the shares mature, the owner may accept their cash value. In some associations, however, he may convert his installment shares into accumulative prepaid shares. He may then allow them to remain indefinitely and to accumulate compound interest at the rate allowed by the association.

2. Accumulative prepaid shares are shares which have been fully paid for. They are allowed to accumulate interest at the regular rate until such time as they are withdrawn, or until the association sees fit to retire or redeem them for the reason that it is not able to loan the money to advantage.

3. Income, or investment shares are bought outright for cash and paid for in one sum. They are issued to investors who desire to secure a regular annual or semiannual income on their investments.

Not all associations issue all the shares mentioned. All associations, however, issue installment shares, and some associations issue either or both income shares and accumulative prepaid shares.

Most building and loan associations operate under the serial plan.

To find the amount of refund due on withdrawing from a building and loan association.—

Example.—J. A. Clark subscribed for 10 shares in a building and loan association. He paid \$1 a month per share for 8 years, when he withdrew. If he is allowed 3% per annum, what amount will be returned to him.

$12 \times 8 \times 10$ = \$960, the total amount paid
$(1 + 96) \times \frac{96}{2}$ = 4656, the total number of months \$1 draws interest
$4656 \div 96$ = $48\frac{1}{2}$, the number of months the amount paid in draws interest
$\$960 \times \frac{48\frac{1}{2}}{12} \times .03$ = \$116.40, the interest allowed
\$960 + 116.40 = \$1076.40, the amount returned

To find the number of months \$1 draws interest, it would be necessary to add 96 + 95 + 94, etc., down to 1. This is a long process. By the short method, *add the two numbers, the smaller and the larger, and multiply the sum by* $\frac{1}{2}$ *the larger number.*

Then, $1 + 96 \times 48$ $(97 \times \frac{96}{2}) = 4656$, the total number of months \$1 draws interest. Dividing 4656 by 96 gives $48\frac{1}{2}$, the number of months the whole amount paid in draws interest at 3%. Therefore, $\$960 \times \frac{48\frac{1}{2}}{12} \times .03 = \$116.40$, the interest allowed.

Problems

1. A man paid \$1 a month per share for 20 shares in a series for 6 years. If he withdraws and is allowed 4% interest per annum, how much will be returned to him?

2. A member of an association withdraws after he pays \$1 per month for 30 shares for 10 years. If he is allowed 5% interest, how much will be returned to him?

3. An investor paid \$1 a month per share for 25 shares in a building and loan association. The shares matured in 8 years and he was allowed 6% interest. How much were his shares worth?

To find the amount of profit which should be apportioned to building and loan shares.—

Example.—An association issued two series of shares. The first series of 500 shares was dated April 1, 1927, and the

second series of 300 shares was dated July 1, 1927. The dues were \$1 a month per share. On April 1, 1929 the two series showed a profit of \$3640. How much of this profit should be apportioned to each share?

From April 1, 1927, to April 1, 1929 = 2 yr., or 24 mo.
\$1 per mo. $\times$ 24 mo. = \$24, amount per share paid on first series
$500 \times \$24 \times 12\frac{1}{2}$ $(24 + 1 \times \frac{24}{2} \div 24 = 12\frac{1}{2})$ = \$150,000 for 1 mo.

$300 \times \$21 \times 11$ $(21 + 1 \times \frac{21}{2} \div 21 = 11) = \frac{69,300}{219,300}$ for 1 mo.

$\$3640 \times \frac{150,000}{219,300}$ = \$2489.74, first series' share of the profit

$\$3640 \times \frac{69,300}{219,300}$ = \$1150.26, second series' share of the profit

\$2489.74 $\div$ 500 = \$4.98, apportioned to each share in the first series
\$1150.26 $\div$ 300 = \$3.83, apportioned to each share in the second series

Problems

1. A building and loan association issued two series of shares. The first series of 300 shares was dated June 1, 1927, and the second series of 200 shares was dated Dec. 1, 1927. The dues were \$1 a month per share. On June 1, 1929, there was a profit of \$1820 to the credit of the two series of shares. How much should be apportioned to each share?

2. The Mount Vernon Building and Loan Association has three series of shares outstanding which have not matured. The first series of 600 shares is dated July 1, 1926; the second series of 500 shares is dated Oct. 1, 1926; and the third series of 400 shares is dated April 1, 1927. The dues are \$1 a month per share. On July 1, 1929, the total profit to the credit of the three series of shares is \$4410. How much should be apportioned to each share?

Savings and Investments Problems

1. C. W. Long deposited \$50 per month in a savings bank from July 1, 1926, when he made his first deposit, until Jan. 1, 1929, when he made his last deposit. If the bank paid $4\frac{1}{2}\%$ interest and credited the interest to the account every 6 months on Jan. 1 and July 1, how much should Mr. Long have to his credit on July 1, 1929?

2. Mr. Long withdrew the amount he had in the savings bank, as shown in the preceding problem, and invested in three 500-dollar and four 100-dollar $5\frac{1}{2}\%$ mortgage certificates, interest payable semiannually. How much was his annual income?

3. Postal Savings Banks pay 2% per annum on postal-savings certificates and $2\frac{1}{2}\%$ per annum on postal-savings bonds. A depositor who

owns thirty $50 and twenty $100 postal-savings certificates exchanged them for postal-savings bonds. How much did he increase his income?

4. In the preceding problem, if this depositor had put his money in a savings bank at 4½% interest and had had the interest credited to his account every 6 months, how much greater would his income have been during the first year than was his annual income from the bonds?

5. (a) If this same depositor had invested his money in a real estate mortgage at 6%, interest payable semiannually, how much would his annual income have been increased, as compared with the interest received from the savings bank? (b) If he had deposited the interest earned for the first 6 mo. in a savings bank at 4½%, how much more would his interest income have been increased?

Depreciation

In practically all industries, and in business generally, **depreciation** is an item to be calculated.

A very common way of reckoning depreciation is by finding the difference in the value of the property or article at the beginning and again at the end of a period of time, say, five years. Then, to find the average annual depreciation, divide the total depreciation by the number of years, in this case 5.

Another way is to take a certain per cent each year, or each fiscal period, from the **book,** or **inventory, value** of the property. By this plan the depreciation is only estimated. It is rarely even approximately correct.

After the cost, or first value, of the property has been completely absorbed by depreciation, there may still be a **reclaim,** or **junk, value** of which one will have to take account.

Problems

1. The book value of a factory building in the beginning was $28,000. At the end of 8 years the book value was $12,000. How much was the average annual depreciation?

2. In the preceding problem, the land on which the factory building stood increased in value, in the 8 years, from $12,000 to $24,000. (a) How much was the net depreciation of the whole property? (b) How much was the average net annual depreciation?

3. The average period of active service of an automobile is 5 years. An automobile that cost $1864 complete had a junk value of $112 at the end of 5 years. Find the average annual depreciation.

4. In the preceding problem, take 20% each year from the new book, or inventory value, and compare the book value at the end of 5 years with the junk value, $112. What is the difference in the two values? (The first book value will be the original cost; the second book value will be 20% less than the first; the third, 20% less than the second, and so forth.)

5. New machinery was purchased at a cost of $40,000. Thereafter 10% each year was written off from the new inventory, or book, value and charged to depreciation. At the end of 10 years the junk value of the machines was $9200. (a) How much was charged to depreciation during the 10 years? (b) What is the difference between the junk value and book value at the end of the 10 years?

6. A building, which cost $32,500 to build 10 years ago, was totally destroyed by fire. The insurance adjusters decided that the building was worth only $24,000 at the time of the fire. They made settlement on this basis by paying 80% of the adjusted valuation. (a) What was the average annual depreciation on this building? (b) How much did the owner lose as a result of the fire, not including the depreciation?

7. During a period of 10 years, 5% of the net profits of a business was set aside as a reserve for depreciation. This account at the end of 10 years amounted to $28,000. Find the average annual net profit during this time.

8. A manufacturing concern purchased $52,000 worth of machinery for a certain purpose. For 6 years, 10% of the first cost of this machinery was taken from the gross profits and put in a reserve for depreciation account. At the end of 6 years, changes had taken place which rendered this machinery of no value other than its junk value. It was finally disposed of for $7000. Charge the difference between the first cost of this machinery and the junk price to the reserve account, and show how this account stands.

Banking and Loans

The banking business is conducted for the most part by corporations. Those conducting national banks are incorporated under the Federal banking laws, and those conducting state banks or trust companies are incorporated under state banking laws.

The capital of a banking corporation is derived in the beginning from the sale of stock, in the same way as in any other corporation. This capital is used in conducting the bank's business. Later the principal source of income to a bank is loaning the money on deposit, and using the deposits to discount negotiable paper, for which a discount rate is charged, or to purchase income-producing securities.

Banks are required to keep only from 15% to 20% of the total deposits available with which to pay checks or meet obligations. Therefore, they may loan from 80% to 85% of the total deposits.

Problems

1. The total deposits in a small bank average, month after month for one year, \$240,000. Eighty per cent of the amount on deposit is loaned or invested, the interest return averaging $5\frac{1}{2}\%$. If the interest paid by the bank to depositors, at the rate of 2% per annum on balances of \$1000 or more, amounted to \$3412, how much did the bank gain in interest in 1 year?

2. A bank discounted a 60-day note for \$1000 at 6%. When this note was paid, the total returns from this transaction (\$1010) were used to discount a 60-day note at 6% for \$1010. This transaction was repeated six times during the year. What annual rate of interest did the bank get on the original \$1000? (It will be discovered that the bank gets \$61.52 for the use of \$1000 for 1 year. Had the bank loaned the interest collected in advance at the same rate or any rate, the interest income would have been increased by the amount of this interest. In discounting paper, a bank collects its interest in advance so that it is possible for it to get compound interest by loaning the interest on interest collected in advance.)

3. A savings bank has deposits amounting to \$2,460,000. Of this amount, \$2,100,000 is loaned on real estate first mortgages at 6% per annum; \$200,000 is invested in bonds at 5%, and \$100,000 is invested in approved securities at $5\frac{1}{2}\%$. The bank pays depositors $4\frac{1}{2}\%$ interest on deposits, the interest being credited semiannually, to their respective accounts. Using the data given, find how much the bank gains in interest in 1 year. (Savings banks may loan a much greater percentage of their deposits than may business banks.)

4. A depositor had \$1500 on deposit in a savings bank. On this account he received $4\frac{1}{2}\%$ compound interest semiannually for 3 years, and made no withdrawals. The bank loaned his \$1500 to others at 6%; and, because it collected its interest semiannually, the bank was able to get compound interest by keeping the interest loaned. How much did the bank gain in interest in the 3 years?

Bank Clearings

In the larger cities most banks belong to what is known as a **clearing house association,** which controls and operates a clearing house where bank representatives meet on each business day and settle their accounts. Thus all checks and

other credits drawn on one bank and held by another are adjusted.

In the smaller cities, there is usually an association which arranges to meet at different periods at one of the banks belonging to the association. The banks take turns in permitting the association the use of a room in which to transact its business.

In a place where there is no association, the clearings have to be handled by messengers who go from bank to bank.

Clearings are usually made at some time during the forenoon, and settlements are made before the banks close for the day.

In one small clearing house association, for example, there are six members. Each bank takes to the clearing house all checks which it has received on deposit or cashed and which are drawn on other local member-banks of the association. All the other member-banks do the same. These checks having been turned in, the clearing house is charged with the total from each bank. The checks turned in are sorted, according to the bank on which they are drawn, and charged against this particular bank. The balance, in the case of each bank, is either in favor of the particular bank or in favor of the clearing house. Settlement may be made at once or later in the day.

For example: the First National Bank brought to the clearing house checks amounting to $2400, drawn on other banks but cashed by the former. Other banks brought to the clearing house checks drawn on the First National amounting to $2600. Therefore, the First National Bank owes the clearing house $200, since this sum must be paid by it to the other banks who cashed $200 worth of paper drawn on the First National. Had the reverse been the case, the clearing house would have owed the First National Bank $200. In the final adjustment the clearing house account must balance.

The following table shows the clearings of the members of a particular association for one day:

Member Banks	*Checks on First Nat.*	*Checks on Traders*	*Checks on Com'l*	*Checks on Merchants*	*Checks on Farmers*	*Checks on Exchange*
First National...	.....	587.30	1512.60	715.20	925.40	371.70
Traders Nat'l...	276.15	.....	911.20	1020.00	1040.00	417.30
Commercial Nat'l.....	592.20	384.75	.....	581.70	925.16	374.15
Merchants Nat'l	710.00	288.15	342.16	.....	284.10	576.25
Farmers Nat'l...	472.25	815.60	541.20	292.75	.....	834.67
Exchange Nat'l..	975.35	210.20	282.90	567.20	442.15	.....

Add from left to right to find the amount with which each bank is credited, or the total of the checks which each bank brought to the clearing house.

Add the different columns to find the amount charged against each bank.

Problems

1. In the table given above, find the balance of each bank's account, either in favor of the bank or in favor of the clearing house.

2. (a) What amount did the different banks owe the clearing house? (List the banks, the amounts for each, and the total.) (b) What amount did the clearing house owe the different banks? (List the banks, the amount for each, and the total.)

3. Show in detail how the clearing house account will stand after all settlements are made.

4. How much were the clearings on this particular day?

Investment Problems

1. The net income from a certain property is $7500. If money is worth 6%, what is the capitalized value of this property?

2. A man owns a building and the lot on which it stands, for which he receives $8000 a year as rental. His expenses annually average about $1840 for taxes and upkeep. If 7% net is considered a fair return on investments of this kind, what is the capitalized value of this building and lot?

3. The rental income from a certain property has increased in 10 years from $4500 to $12,800. If the attending expenses and taxes have increased from $400 to $1260 in this time and money is worth 6%, what has been the increase in the capitalized value of this property?

4. How much can be paid for stock that yields a dividend of $5\frac{1}{2}\%$ semiannually, if money is worth 6%?

5. Which is the better investment and how much: real estate first mortgages at 6% annually or 5% bonds purchased at 86?

6. After all expenses of a business have been paid, the net profit shows an increase from \$1500 the first year to \$17,700, the sixth year. If money is worth 6% interest, what has been the average annual increase in the capitalized value of this business over the six-year period?

7. The owner of property, from which he received a net rental of \$7200 a year, sold it for \$120,000. He invested this amount in 5% bonds at 80. Did he increase or decrease his income, and how much?

8. J. C. Cramer bought an apartment house for \$240,000. He kept it 8 months, during which time he collected \$18,200 rent and paid taxes and other expenses amounting to \$8920, and then sold it for \$237,500. If we allow 6% interest on the money he had invested, did he gain or lose, and how much?

Deferred Payments.

1. An automobile is priced at \$1470, delivered fully equipped. The down payment is $\frac{1}{3}$ of the list price. The payments are \$91.10 a month for 12 months. How much did the automobile cost the purchaser?

2. (a) In the above problem, how much was the cost to the purchaser in excess of the list price? (b) What rate of interest annually would have to be charged on the balance, after the $\frac{1}{3}$ had been paid, to make the interest equal the excess price? (c) If 6% interest annually is charged on the deferred balance, what rate is charged for financing the transaction?

3. The dealer's cash price of an automobile delivered is \$1200. The purchaser makes a down payment of $\frac{1}{3}$ of the cash price. The charge for financing the transaction over a period of 10 months is 10% of the unpaid balance and \$24 additional for insurance. Find the amount of each monthly installment.

4. A used car is priced at \$600. The down payment is 40% of the price. The charge for financing this transaction, including insurance, interest, and service, for a period of 6 months, is 10% of the price. Find (a) the amount of the note the purchaser will have to sign, and (b) the amount payable each month in equal installments.

5. An oil burning heater priced at \$950 is installed on the deferred payment plan. A cash payment of \$50 is made at the time of signing the contract; $\frac{1}{3}$ of the balance is paid in cash at the time the heater is installed; the balance with interest at 6% for two years is to be paid off in 24 (2 years) equal monthly installments. Find (a) the amount of each payment, and (b) the total cost of the heater.

PROJECT 1

A married man's annual income was as follows: salary, $2100; interest on investment, $300; interest on savings bank deposits, $40; extra pay, $135; other income, $65. Find his total income.

At the beginning of the year he prepared a budget of expenses as follows: rent, 25%; food, 20%; clothing, 15%; church and amusements, 10%; doctor and dentist, 5%; incidentals, 5%; insurance, 5%, and savings, 15%.

His disbursements were as follows: rent, $65 per month; food, $484.60; clothing $372.80; church and amusements, $212.25; doctor and dentist bills, $175; incidentals, $87.50, and insurance, $126.30.

Questions

1. How much was apportioned for each item in the budget?

2. Reconcile each item in the budget and find how much he saved for the year.

3. What per cent of his income did he succeed in saving?

4. What per cent of his income did the food and clothing for the family cost?

5. Is it a good plan to have a family budget? Why?

6. Should some part of the income be saved and invested? Explain.

7. Can a man meet emergencies better if he has securities on which he can borrow money? Explain.

8. Suppose that this man owns 20 shares of stock in the American Telegraph and Telephone Company; par value, $100 per share; market value, $198 per share. Explain how he would go about securing a loan of $500 from a bank with which he does his banking business.

PROJECT 2

A farmer's records show the following farm income for the year 1928: 28 tons of hay, sold for $21 per ton; 3 calves, sold for $16.50 each; 247 dozen eggs, sold for an average of 48¢ per dozen; 325 bushels of potatoes, sold for $1.30 per bushel; 450 bushels of wheat, sold for $1.28 per bushel; 150 bushels of corn, sold for 88¢ per bushel; milk for the year from 10 cows, sold for $1272; the apple crop, sold for $550; 528 pounds of poultry, sold at an average of 28½¢ per pound; income from other sources, $284.

His expenses for the year were as follows: fire insurance on buildings, $54; seed grain, $112; repairs to machinery, $77.20; hired help, $420; household expenses, $658; clothing for family, $214; feed for cows,

$312; new machinery, $160; new harness, $72; incidental expenses, $187.20; interest on the $5000 mortgage on the farm, $300. The farm was bought for $12,000, and the farmer allowed $75 per month for his labor in addition to the food for the family, which comes from the farm.

Questions

1. How much did he make or lose in the year?

2. What was the per cent of profit or loss on his equity in the farm? (His equity is the difference between the cost of the farm and the amount of the mortgages, or $7000.)

3. His total net income was equal to what wage per month?

4. Is his farming profitable?

5. How does this investment compare with an equal investment in stock that pays 6% dividend?

6. Should the whole cost of the new machinery and the new harness, which will last 10 years, be charged against this year's earnings? If not, what part should be charged?

7. Not counting the labor, how much did the farmer make on his cows?

8. How much was the net income from the grain and potato crops?

PROJECT 3

A grocer's records for the year 1927 show, in detail and in the aggregate, the following: purchases of goods, $40,466.20; cash sales, $50,267.55; sales on credit not yet collected, $1240.60; paid for rent, $1500; paid for help, $3800; paid for freight on goods received, $314.80; paid for cartage and deliveries, $829.40; paid for supplies to use in store, $296.70; paid for repairs to equipment, $212.25. The inventory of goods on hand at the beginning of the year was $7886.12 net; and at the end of the year the inventory was $9416.30 gross. To cover loss on goods spoiled and shopworn, 5% was deducted from gross inventory.

Questions

1. Find the grocer's net profit for the year.

2. After allowing 5% of gross profit on sales for bad debts, the grocer's net profit for the year was equal to what salary per week?

3. The grocer employed two men for full time work, and he gave his full time to the business. Do you consider that he did a good business? Explain.

4. The grocer had $10,000 invested in the business. Is he entitled to interest on this investment? If so, how much interest?

5. Should this interest be deducted from the profit before finding the grocer's salary per week? Explain.

6. The grocer's net profit is equal to what rate per cent of interest per annum on his investment?

7. After deducting a salary of $3000 a year for the grocer, what rate of interest would he get on his investment as found in question 6?

8. His operating expenses were what per cent of his profits on sales?

PROJECT 4

A wholesale merchant's records for the month of November exhibit the following: gross sales for the month on the usual terms, 5% 10 days or 90 days net, $24,800; net payments by customers on account after the 5% discount has been allowed, $17,124; net payments by customers at expiration of 90 days, no discount allowed, $6,712.50; purchases from manufacturers and sales agencies, $12,950, terms 8% discount for cash, 10 days' or 4 months' credit. On November 15 a 4-months' note for $10,000 was discounted at 6% at the Merchants Bank and cash was paid for purchases, up to date $11,914. The expenses paid for the month were as follows: rent, $450; salaries of sales force, $1,975; office help, $350; advertising, $400; office supplies, $120; freight and cartage, $617.50.

The uniform profit was 25% on gross sales, and 2% was allowed for loss, shrinkage, and bad debts.

Questions

1. What was the merchant's profit on sales after deducting the 2% for bad debts?

2. What was his net profit for the month? (Assume that all purchases were discounted at 8% and that 75% of all sales were discounted at 5%.)

3. (a) What were the gross sales for the collection made during the month? (b) What was the gross profit on these sales?

4. How much did the merchant make by borrowing the $10,000 at the bank and discounting his bills? (Show all figures.)

5. What per cent of the gross profit were the operating expenses?

6. If the merchant had $150,000 invested in this business, did this month's business show a good return on the investment? What per cent yearly?

7. (a) About what salary should the owner draw? (b) How would the amount of the owner's salary affect the rate of income on the investment?

8. What is the business of the wholesaler or jobber?

PROJECT 5

A mason had the following contracts during the month of April:

Contract 1:

A contract to build a retaining wall of stone 100 ft. long, 3 ft. high, and 2 ft. thick, on a base of stone and concrete 3 ft. wide and 18 inches deep, at \$1.80 per cubic foot for the wall and \$1.30 per cubic foot for the base. He paid for material and labor the following amounts: stone, \$3.40 per cu. yd.[1] (in finding the number of cu. yd. of stone allow $\frac{1}{5}$ for mortar); cement, 6 tons, at \$16 per ton; excavating and removing of dirt, \$2.25 per cubic yard for base, plus 10%; sand, 38 yd. at \$1.10 per yard; labor, 3 men 15 days each at \$6 per day and 3 masons 15 days each at \$16 per day; supplies, lumber, tools, etc., \$38.20.

The contractor spent 5 full days on this contract, charging \$25.00 per day for his time.

Questions

1 Exclusive of the charge for his time, what amount of profit did the contractor make on this job?

2. What per cent of the total cost of the job was the cost for (a) labor, (b) masons, (c) material? (Give each result in the nearest whole number of per cent.)

3. What per cent of the total cost was the profit from this job? (Carry your result to two decimal places.)

4. If contractors bid on jobs so as to make 25% profit on the cost of the completed job, how much was this contractor's bid out of the way?

5. (a) How much capital would the contractor need to handle this job? (b) Is he entitled to interest at current rate on this capital invested in this business? (c) Should this interest be deducted from profit?

Contract 2:

A contract to build a cement sidewalk 4 ft. wide around the outside of a city block 500 ft. long and 250 ft. wide, at 48¢ per square foot. Material and labor costs were as follows: excavating, grading and leveling to a depth of 6 inches, 90¢ per cubic yard; 50 yards of broken stone, at \$3.25 per yard; 50 yards of cinders, at \$2.50 per yard; 20 tons of cement, at \$15.50 per ton; 60 yards of sand, at \$1.05 per yard; labor, 6 men for 12 days, at \$6.25 per day, 5 masons for 12 days, at \$16.00 per day; materials other than those mentioned, \$58.60. The contractor discounted his 60-day note for \$2,500, at the Traders National Bank.

[1] The nearest whole number of cu. yd. is figured in estimating the job.

Questions

1. How much was made on this contract?

2. (a) Did this contract show a good margin of profit? (b) What per cent on cost?

3. The contractor gave 8 full days' time to this job. How much per day did he make?

4. Do contractors (a) make a charge for their time; (b) estimate a time charge in the bid; or (c) allow for extra profit to compensate for their time? Ask some contractor for the answer.

5. What per cent of the whole cost was the cost for masons on this job?

6. Find the net proceeds of the $2500 note discounted at the Traders National Bank.

7. Would it be possible for the contractor to give this contract as collateral security for the $2500 loan? Explain how he would proceed. Ask a banker for the answer.

8. What was this contractor's net profit on the two jobs he had this month? On this basis, give a conservative estimate of about what his business would yield for the year, if he loses 2 months of the year, on account of weather conditions.

PROJECT 6

A building contractor contracted to build a house for $18,500. He let sub-contracts as follows:

Excavating for cellar	$ 242.00
Heating	1400.00
Plumbing	1180.00
Mason Work	2360.00
Electrical work	588.00
Painting	835.00
Roofing	1130.00
Tinning	287.50

He paid for lumber $3848; for mill work $2372.50; for hardware $48; for carpenters' wages $2140, and laborers' wages $680. Expenses and losses not reckoned amounted to $234.30. To finance this contract he had his 6-months' note for $7000, dated April 1, discounted at his bank at 6%.

Questions

1. What were the net proceeds of his $7000 note?

2. How much did this house cost the contractor to build?

3. How much did he make on this contract, allowing for the costs as listed?

4. The contractor made 10% on each sub-contract. How much did this amount to?

5. Including the 10% profit on the sub-contractors' contracts, how much did the contractor make?

6. What per cent of the total cost was the cost of the skilled and unskilled labor the contractor employed?

7. What per cent of profit did the contractor make on the actual amount which the house cost him?

8. If each sub-contractor made 20% on his contract and each dealer made 30% on the material furnished, what was the total profit made on this house?

9. The owner of the house had to pay $25 for having the property surveyed; $254 for having the title searched and insured; $160 to finance a loan of $8000; 6% of the contract price to the architect who drew the plans; $175 for hardware not furnished, and $290 for light fixtures. How much was the total cost of the house to the owner?

10. After the house was completed and the owner moved in, he paid $165 to have the grading done, $38 to have sidewalk relaid, and $50 to have the house insured for $10,000 for three years. What is the total cost of the house to the owner exclusive of the insurance premium?

11. The property is assessed for $15,000 and the tax rate is $.02451. If the annual upkeep of this house amounts to $240 and 6% interest is allowed on the owner's equity, in addition to all expenses including the cost of insurance for one year, the total cost of owning this house is equal to what rent per month?

PROJECT 7

On January 2, 1929, Mr. Harris and Mr. Morgan invested $15,000 each and bought out the coal and lumber business of the J. H. Prine Company, at the inventory price of the coal and the lumber, $40,000 for the yard and the buildings and $8000 for the equipment. The coal was inventoried at $5600 and the lumber was inventoried at $22,800. The terms of this purchase were as follows: mortgage for $30,000 at 6% on the building and yard; 4 notes for $5000 each at 6% interest payable in 1 year, 2 years, 3 years, and 4 years, respectively. The balance of the purchase price was paid in cash. All papers necessary in the sale and transfer of this business were dated January 2, 1929.

The business organization under the new management is as follows: J. H. Harris, President, at a salary of $4800 a year; C. D. Morgan, Vice President and Treasurer, at $4800 a year; C. L. Cooper, Secretary, at $3600 a year; E. M. Fink, bookkeeper, at $2400 a year; A. D. Lance, assistant bookkeeper, at $1200 a year. Miss Hazel Martin, office secretary, at $30 a week; and 5 yard and delivery men, at $33 a week.

During the first month, January 2 to February 1, the new firm's sales of coal amounted to $5800 and the sales of lumber amounted to $8390.

Questions

1. Allowing 25% of sales as the gross profit, find the gross profit for the first month.

2. The total of the operating expenses for the month, not including salaries, is $735.60. Including the salaries and wages as listed, find the net profit for the first month (4 weeks).

3. Each partner invested $15,000 cash. After allowing 6% interest for one month on the capital invested and the interest for one month on the notes and on the mortgage payable, what was the net profit?

4. The net profit for the first month is equal to what per cent of the total investment?

5. The net profit for the first month is equal to what annual rate per cent of interest on the total capital?

6. On the basis of the first month's business, after allowing $1825 for bad debts and $1860 for unexpected losses, how much would be the profit or the loss for the year?

7. During the year the lumber purchases amounted to $79,274; the coal purchases amounted to $32,260; the sales of lumber amounted to $98,412, and the sales of coal amounted to $43,364.60. On January 2, 1930, the lumber inventory amounted to $38,970 and the coal inventory amounted to $6328. Find the gross profit on sales for the year.

8. Taking the first month's expenses as an average, calculate the probable net earnings for the year. Use the gross profit on sales in question 7 and the expenses and losses as listed in the first month's business as a basis for calculation.

9. Find each partner's present worth at the end of the year, according to the results in questions 7 and 8. (The interest on each partner's investment is included.)

10. Using the net earnings as found in question 8, find the per cent of profit on capital invested.

PROJECT 8

On July 2, 1929, J. H. Thomas, E. M. Faust, and C. H. Marshall organized the J. H. Thomas Woodworking Company with a capital stock of $50,000; of which $25,000 was in 7% cumulative preferred stock and $25,000 in common stock. The stock was all sold and paid for in full at its par value of $100 a share. The newly organized company bought out the mill property, machinery, stock, and goodwill of the Hartmann Woodworking Company on the following terms: purchase money mortgage at 6% interest for $\frac{1}{2}$ the price, $\frac{1}{4}$ cash, and $\frac{1}{4}$ in three term notes of equal amount for 1 year, 2 years, and 3 years, respectively, at 6%. The entire property was purchased for $60,000.

The new organization consisted of J. H Thomas, President, at a salary of $3000 a year; E. M. Faust, Vice President and Sales Manager, at $3000; C. H. Marshall, Secretary and Treasurer, at $3000 a year; O. D. Doty, bookkeeper, at $1500 a year; Miss Mary Jenkins, secretary, at $1200 a year. There were 8 mill men who worked 44 hours a week each at the regular scale of 90¢ an hour, and 4 helpers who worked 44 hours a week each at 50¢ an hour.

The schedule of the property exhibits the following items: buildings and yard, $28,000; machinery and tools, $8500; material, $12,500; equipment, $5000; office furniture and equipment, $1000; and goodwill, $5000.

The first month's business showed returns as follows: contracts for mill work, taken and completed, $7650; contracts for mill work, taken and not completed, $3960; purchase of new material, $2990; sales of old stock, $1236. (All salaries and wages are paid on the business day nearest the first and the fifteenth of the month.)

Questions

1. (a) Find the total value of the property as per schedule. (b) How many shares of capital stock were issued?

2. What amount of dividend annually would have to be paid on the preferred stock before the common stock would share in the dividend?

3. For how much was each of the three notes given in the purchase of the property and how much interest was paid on the note by the time it matured? (Reckon simple interest only.)

4. Find the amount of the pay roll for the first two weeks, allowing $5\frac{1}{2}$ working days of 8 hours each for each week.

5. If $\frac{1}{2}$ of the incompleted contracts were completed during July and $33\frac{1}{3}\%$ profit was figured on all work done and on all stock sold, find the gross profit for July.

6. Considering July's business under the new management a good monthly average, find the net profits for the month.

7. Allowing $340 per month for general operating expenses, find the total expenses for the year, including all salaries and wages.

8. At the opening of business, after the property had been purchased and settled for, how much was the balance of cash on hand?

9. Using the information already given and the results obtained, find the probable net profit for the year. (The net profit is equal to twelve times the gross profit for July, minus the expenses for the year.)

10. After setting aside 10% of the net profit as a sinking fund, and 7% of the $25,000 preferred stock for dividend purposes, what even per cent dividend, according to the probable net profit, could be declared on the common stock? How much remained in undivided profit?

PROJECT 9

The Goold Brothers, J. H. and R. E. Goold, owned and operated a department store consisting of the following five departments: furniture, hardware, crockery and dishes, household utensils, and victrolas and radios. Each of the two brothers have $40,000 invested in the business.

Their balance sheet on January 2, 1928, exhibited the following: cash on hand and in the bank, $14,812.10; accounts receivable, $3780; notes receivable, $2500; real estate, store building and lot, $45,000; store equipment, $5700; delivery equipment, $1200; office furniture and equipment, $1500. Stock in the different departments inventoried as follows: furniture, $11,280; hardware, $8362; crockery and dishes, $5788.50; household utensils, $6315; victrolas and radios, $4723; accounts payable, $15,575; notes payable, $8000. Each partner's drawing account is credited with $3692.80.

During the year the gross purchases and sales in the different departments were as follows:

Furniture: purchases, $28,740; sales, $38,462.70;
Hardware: purchases, $17,928.90; sales, $26,442.30;
Crockery and dishes: purchases, $12,482; sales, $18,588.45;
Household utensils: purchases, $11,384.20; sales, $17,732.25;
Victrolas and radios: purchases, $8850; sales, $13,322.60.

The expenses for the year were as follows: general expense, $3470; selling expense, $8366.15; salaries, $10,240; advertising, $5300.

The balance sheet on January 2, 1929, exhibited the following items: cash on hand and in the bank, $17,640.22; accounts receivable, $11,673.10; notes receivable, $3500; real estate, store building and lot, $45,000; store equipment, $5500; delivery equipment, $1000; office furniture and equipment, $1500. Stock in the different departments inventoried as follows: furniture, $14,600; hardware, $8262; crockery and dishes, $6321.30; household utensils, $5930; victrolas and radios, $4820; accounts payable, $17,509.17; notes payable, $10,000. Each partner is credited with $40,000 in his capital account, and $3692.80 in his drawing account.

Questions

1. Take a preposting trial balance to see if the Goold Brothers' ledger is in balance on January 2, 1928.

2. The total credited to the partners' drawing accounts is what per cent of the capital invested?

3. Would it make any difference in the results if each partner was allowed 6% interest on his investment? Prove your conclusion.

4. Find the gross profit on sales for the year in each of the different departments.

5. Find the net profit or loss after deducting the expenses and the depreciations on store equipment and delivery equipment from the total gross profit.

6. Take the totals of the five different trading accounts and find the gross profit on sales, to see if this result agrees with the sum of the gross profit on the different accounts.

7. Compare the net profits of the first year's business with the net profits of the second year's business. (The net profits of the first year's business are exhibited in the partners' drawing accounts.)

8. (a) What amount, as shown by the net profit, should be credited to each partner's drawing account if they share equally? (b) What per cent is this amount of the investment in the case of each partner?

9. Make a statement of assets and liabilities for January 2, 1929, and show proof of your results.

10. Each partner drew a salary of $3000 a year, which is included in the salary account. How much, in the aggregate, did each partner realize from the year's business?

PROJECT 10

A man retires from business with cash assets of $250,000, which he proceeded to invest as follows: loaned, $50,000 on real estate first mortgages at 6% annually, interest payable every 6 months; purchased, 200 shares of G. E. stock at $124\frac{1}{2}$, 200 shares of B. & O. R. R. stock at $98\frac{3}{4}$, 500 shares of A. T. and T. preferred at $137\frac{1}{4}$, 50 shares of bank stock in the Merchants National Bank at $312\frac{1}{2}$, 400 U. S. S. $5\frac{1}{2}$% bonds at $102\frac{1}{4}$, 200 G. B. Improvement 5% bonds at $104\frac{1}{8}$; deposited, $5000 in a savings bank at $4\frac{1}{2}$% interest; kept the remainder of his money as a checking account in the Merchants National Bank.

The brokerage charges for stocks and bonds purchased were as follows: $20 per 100 shares, for the B. & O. stock; $25 per 100 shares, for all other stock except the bank stock, which he purchased direct; $\frac{1}{8}$% brokerage for all bonds.

The dividends are payable semiannually on all the stock, and the interest is payable semiannually on the bonds.

Questions

1. How much did he pay for the brokerage on the stocks purchased?

2. How much did he invest in stocks, including the brokerage?

3. How much did he invest in bonds, including the $\frac{1}{8}$% brokerage?

4. His investments were all made during January, 1929, and all his returns came in during July, 1929, except the interest on the $5000 in the savings bank, which was credited to his account. The semiannual dividends on his stock were as follows: G. E. stock, $3\frac{1}{2}$%; B. & O. R. R. stock, $2\frac{3}{4}$%; A. T. & T. preferred, $3\frac{1}{2}$%; Merchants National Bank Stock, $11\frac{1}{2}$%. How much was his total income for the first 6 months?

5. How much was his net income after deducting the brokerage charges?

6. He sold his 500 shares of A. T. & T. stock for $149\frac{1}{2}$ soon after receiving his dividend. The brokerage for selling the stock was $25 per 100 shares and the tax was $2 per 100 shares. How much did he make on this stock?

7. His profit on his investment in the 500 shares of A. T. & T. stock was equal to what annual rate per cent of interest for the 6 months?

8. What annual rate of interest for the six months did all his investments and savings bank deposits yield on the total amount invested? (Add the brokerage charge to the cost of the stock.)

9. If money invested in real estate first mortgages earns 6%, are they a better investment than the bonds purchased in this project?

10. (a) Find this man's annual gross income, on a basis of the returns for the first 6 months. (b) Which investment produced the best interest return?

11. This man is married and has two children, one 14 and the other 16 years old. Compute his income tax: (a) Federal, and (b) state.

Part II

GRADED ASSIGNMENTS AND REVIEW ASSIGNMENT TESTS

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FUNDAMENTALS

Assignment 1A

1. A dealer bought 3 bunches of bananas for \$3 a bunch. He sold, in all, from the 3 bunches, 33 doz. bananas for 50¢ a dozen. How much did he make?

2. A merchant bought 250 lb. of cheese at 17¢ a pound, which he sold for 25¢ a pound; 156 lb. of butter at 43¢ a pound, which he sold for 52¢ a pound. How much did he gain?

3. A fruit dealer bought 6 boxes of oranges, each box containing 22 dozen, for \$4.60 a box. He sold the oranges for 35¢ a dozen. How much did he make?

4. Find the total cost of 112 lb. at 62¢ a pound; 245 lb. at 53¢ a pound, and 370 lb. at 71¢ a pound.

5. In problem 4, each pound was sold at a profit of 8¢ a pound. What was the total profit?

6. A man earned \$6.75 a day, working on an average 21 days a month, for 6 months. His expenses averaged \$3.55 a day for 183 days. How much did he save?

7. A contractor paid \$945 for carpenter work to build a barn. Three carpenters worked, in all, 90 days. How much did each receive a day?

8. A contractor agreed to haul 1200 loads of dirt for \$1.70 a load. He hauled, on an average, 8 loads each working day. (a) How long did it take him to haul the dirt? (b) How much did he earn each day?

Assignment 1B

1. A fruit dealer bought 12 boxes of oranges, containing 18 dozen each, for \$6.30 a box. After sorting out 3 doz. spoiled oranges, he sold the good oranges for 50¢ a dozen. How much did he gain?

2. A dealer bought 8 bunches of bananas, containing 56 dozen, for \$2.10 a bunch. He sold 36 doz. for 45¢ a dozen, 12 doz. at the rate of 3 bananas for 10¢, and the remainder at the rate of 4 for 10¢. How much profit did he make?

3. A merchant bought 15 crates of eggs, each crate containing 30 dozen, for \$10.50 a crate. He paid \$7.50 express and sold the eggs for 48¢ a dozen. How much profit did he make, if 6 eggs were broken and unfit for sale?

4. Find how much was gained by buying 1200 bbl. of apples at \$4.80 a barrel and selling them for \$7.25 a barrel, and by buying 800 bu. of

potatoes at $1.55 a bushel and selling them at $2.05 a bushel, if the cost of handling the apples was 50¢ a barrel and the cost of handling the potatoes was 20¢ a bushel.

5. A quantity of cloth was bought and sold on the following terms: 312 yd. were bought for $1.16 a yard and sold for $1.40 a yard; 442 yd. were bought for 88¢ a yard and sold for $1.05 a yard; 568 yd. were bought for 67¢ a yard and sold for 95¢ a yard. (a) Find the total cost. (b) Find the total selling price. (c) Find the gain.

6. A man earned $1120, working 23 weeks, or 140 working days. His expenses for this time were as follows: board and room, $12.50 a week; laundry, $1.20 a week; incidentals, $4.50 a week. (a) How much did he receive a day? (b) How much did he save?

7. A painter contracted to paint a house for $380. He paid $4.80 a gallon for 12 gallons of paint and $1.20 for putty. He employed 5 painters, at $1.10 an hour, for 6 days of 8 hours each. His liability insurance on the men while they were working was $27. How much did he make on this contract?

8. A grain dealer bought 12,000 bu. of wheat in Duluth for $1.66 a bushel. He shipped this wheat to Buffalo, where it was sold for $2.02 a bushel. His expenses were as follows: for handling in Duluth, 2¢ a bushel; freight to Buffalo, $488; for commission and handling in Buffalo, 4¢ a bushel. How much did he gain?

Assignment 2A

1. A salesman earned $35 a week for one year. His average weekly expenses were as follows: board, $7.50; room rent, $4; car fare $1.25; laundry, $1.50; incidentals, $2. During the year he paid $206 for clothes. How much did he save during the year? (Reckon 52 weeks to a year.)

2. A wholesale dealer bought 400 bbl. of sweet potatoes in Atlanta, Ga., for $3 a barrel. He paid freight to New York, $280; and cartage, $120. He desires to make a profit of $1 a barrel. For how much a barrel must they be sold?

3. A contractor hired three men to work on a building eight hours a day. He agreed to pay the first man 90¢ an hour; the second man, $1.10 an hour, and the third man, 80¢ an hour. The first man earned $288, the second man earned $440, and the third man earned $384. How many days did each man work?

4. A junior mechanic earned $21 a week the first year, $24 a week the second year, and $28 a week the third year. His expenses for the three years averaged $15.90 a week. How much did he save?

5. Find the average weight of 10 bales of hay weighing, respectively, 240 lb., 264 lb., 241 lb., 244 lb., 248 lb., 251 lb., 261 lb., 238 lb., 249 lb., and 264 lb. Find the cost of baling this hay at 25¢ per 100 pounds.

6. A dealer bought 100 bales of cotton, weighing 56,000 lb., at 14¢ a pound. He kept the cotton 3 months, during which time he lost two bales weighing 1120 lb. He sold the 98 bales remaining for 21¢ a pound. Did he gain or lose, and how much?

7. A customer bought the following articles: soap, 45¢; powder, 30¢; toothbrush, 55¢; toothpaste, 40¢; 5 towels at 35¢ each; 4 washcloths at 12¢ each. She gave in payment a $20 bill. How much change should she receive?

8. A farmer raised 288 bu. of potatoes on 3 acres, and 735 bu. of oats on 21 acres. How many bushels of each did he raise to the acre?

Assignment 2B

1. A young man who was employed as a reporter paid $8.50 a week for board, $3.75 for a room, $1.50 for laundry, $2.25 for car fare, and for incidental expenses an average of $3 a week. If he saved $877 after paying $215 for clothes, how much was his salary per week?

2. A tobacco dealer bought 20,000 lb. of tobacco in Havana for 21¢ a pound. He paid freight to Philadelphia, $197.50; cartage, $45; storage, $70, and insurance, $37.50. For how much a pound must he sell the tobacco to gain $450?

3. A farmer owned three farms. From the first farm he sold $3,412.50 worth of produce during the year; from the second farm he sold $324.75 less than from the first; and from the third he sold $118.60 more than from the second. How many dollars' worth did he sell from all three farms?

4. A grain dealer bought 28,000 bu. of wheat at $1.67 a bushel. He kept the wheat 4 months and sold it for $2.11 a bushel. His expenses were as follows: interest on money borrowed, $400; storage, $140, and loading, $70. How much did he gain?

5. In a certain school there were 312 pupils. The expenses of the school were as follows: teachers' salaries, $14,000; books, $420; supplies, $539.40; janitor, $900; coal, $280; and incidentals, $225. What was the average cost per pupil of running the school?

6. Find the cost of 340 yd. of cloth at 62¢ a yard; 518 yd. at 93¢ a yard; 437 yd. at $1.23 a yard; and 763 yd. at 87¢ a yard. If the freight was $28.60, the cartage $3.50, and packing $12.80, what was the total cost of this consignment?

Assignment 3A

1. The population of a certain city was 35,400, and the cost of running the departments of the city government for one year was $424,800. Find the per capita cost of the city government.

2. In a certain school district there were 392 pupils attending school. The cost of books in this district was $784, and the cost of supplies was $862.40. Find the cost per pupil for books and supplies.

3. A merchant's sales were as follows: Monday, \$812.40; Tuesday, \$914.25; Wednesday, \$764.70; Thursday, \$872.70; Friday, \$583.95; Saturday, \$1,284.36. What were his average daily sales?

4. A man earned \$325 a month, and his expenses averaged \$225 a month. How long will it take him to save \$3600 to purchase a house and lot offered for \$8600 on the following terms: cash, \$3600; mortgage for balance at 6% interest?

5. The circulation of a daily paper for one week was as follows: Monday, 128,600; Tuesday, 128,420; Wednesday, 129,100; Thursday, 129,240; Friday, 128,780; Saturday, 129,570; Sunday, 140,980. What was the average daily circulation?

6. The yearly expenses for a family of 6 persons were as follows: rent, \$480; food, \$1280; clothing, \$678; books and amusements, \$128.80; fuel, \$240; incidentals, \$123.60. Find (a) the total expenses, (b) the average monthly expenses, (c) the average expenses of each member of the family, (d) the amount saved if the income was \$5000.

7. If it requires 1580 ties and 328 rails to lay one mile of railway, how many ties and how many rails will be required to lay 1250 miles of railway?

8. A man traded 1250 acres of woodland, valued at \$15 per acre, for an improved farm of 125 acres. How much per acre did the farm cost him?

Assignment 3B

1. Truckloads taken from a carload of coal weighed as follows: 6450 lb.; 5980 lb.; 6250 lb., 6120 lb.; 5700 lb.; 6080 lb.; 6360 lb.; 5990 lb.; 6320 lb.; 6410 lb.; 6170 lb.; 5880 lb.; 6290 lb. (a) How many tons of coal were in the car? (b) What was the coal worth at \$5.80 a ton? (Reckon 2000 lb. to a ton.)

2. Loads of wheat delivered to a storage house weighed as follows: 3120 lb.; 3090 lb.; 2980 lb.; 3040 lb.; 3280 lb.; 2990 lb.; 3240 lb.; 3060 lb.; 3220 lb.; 3040 lb.; 3170 lb.; 3210 lb. (a) Find the number of bushels stored and (b) the value at \$1.80 per bushel, allowing for 20 bu. shrinkage (60 lb. to a bushel).

3. Find the total cost of 4260 lb. of wheat at \$1.92 per bu., of 60 lb. each; 6464 lb. of oats at 51¢ per bu., of 32 lb. each; 8400 lb. of corn at 88¢ per bu., of 56 lb. each; and 5768 lb. of rye at \$1.32 a bu., of 56 lb. each.

4. A fruit dealer bought 7 crates of oranges, 21 doz. to the crate, at \$5.35 a crate; 8 crates, 18 doz. to the crate, at \$5.20 a crate; 6 crates, 16 doz. to the crate, at \$5.20 a crate. He paid \$9.30 freight on the lot. If he sold the first lot for 45¢ a dozen, the second lot for 50¢ a dozen, and the third lot for 60¢ a dozen, how much did he gain?

5. A dealer sold 428 lb. of butter for \$239.58 the first day; 444 lb. for \$253.08 the second day, and 512 lb. for \$296.22 the third day. (a) How many pounds of butter did he sell in the three days? (b) How much did he receive for it? (c) What was the average price per pound?

6. A merchant bought 1280 yd. of cloth for \$384 and sold it for 38¢ a yard; 960 yd. for \$403.20 and sold it for 49¢ a yard; 1530 yd. for \$336.60 and sold it for 28¢ a yard. (a) How much a yard did he gain in the case of each kind of cloth? (b) What was his total gain?

FRACTIONS

Assignment 4A

1. A man with a family spent $\frac{1}{4}$ of his salary for rent and $\frac{1}{5}$ for food How much did he spend for each, if his salary was \$1800 a year?

2. A merchant bought a piece of cloth, containing 44 yd., from which he sold $6\frac{1}{4}$ yd., $10\frac{1}{2}$ yd., and $7\frac{3}{4}$ yd. How many yards remained?

3. A dealer bought 2 carloads of potatoes containing 684 bu. To one party he sold $\frac{1}{4}$ of the number of bushels, and to another party he sold $\frac{1}{3}$. (a) How many bushels did he sell to each party? (b) How many bushels had he left?

4. In one year a merchant made net profits equal to $\frac{3}{20}$ of his investment in the business. How much did he make, if his investment amounted to \$40,000?

5. A man sold $\frac{5}{8}$ of a tract of land for \$4400. At the same rate, what was the whole tract worth?

6. A customer bought $12\frac{2}{3}$ yd. of gingham at 36¢ a yard. If she gave a \$10 bill in payment, how much change should she receive?

7. A farmer had $\frac{5}{12}$ of the wheat in a bin left after selling 490 bu. How many bushels were in the bin before he sold any?

8. A painter spent, on an average, \$4.50 a day, which was $\frac{3}{7}$ of what he earned. How much did he earn in 20 days?

Assignment 4B

1. A tract of land is so divided that $\frac{1}{8}$ is woodland; $\frac{1}{16}$ is unfit for use, and the remainder, 260 acres, is tillable land. How many acres are there in the tract?

2. A house and the lot on which it stands are worth \$14,500. The land is worth $\frac{3}{5}$ as much as the house. How much is the house worth?

3. The land and the buildings on it are worth \$18,800. The land is worth 4 times as much as the buildings. How much is each worth?

4. A man left his estate to his wife and their three children. The oldest child received $\frac{3}{10}$, the next child received $\frac{2}{5}$, and the youngest received $\frac{7}{20}$. What was the value of the estate, if the wife received \$10,200?

5. A merchant bought 1284 yd. of cloth. He sold $\frac{1}{3}$ of it at $62\frac{1}{2}$¢ a yard; $\frac{1}{6}$ of it at $67\frac{1}{2}$¢ a yard and the remainder at $60\frac{1}{4}$¢ a yard. How much did he receive for the cloth?

6. In excavating for a cellar 896 cu. yd. of rock and earth were removed. If $\frac{3}{7}$ was rock and cost \$4.50 per cubic yard to remove, and the remainder was earth and cost 90¢ per cubic yard to remove, how much was the total cost?

7. From a bin of wheat containing 4860 bu., 1580 bu. were sold at one time and 1480 bu. at another time. What fractional part of the wheat remained unsold?

8. A cashier finds that $\frac{2}{3}$ of his change is in \$1 bills, $\frac{1}{6}$ in half dollars, $\frac{1}{12}$ in quarters, $\frac{1}{24}$ in dimes and $\frac{1}{24}$ in nickels. How much change has he, if his dimes amount to \$2?

Assignment 5A

1. A tub of butter weighed $48\frac{1}{2}$ lb., of which the tub itself weighed $2\frac{1}{2}$ lb. What was the butter worth at $47\frac{1}{2}$¢ a pound?

2. A grocer mixed 100 lb. of coffee worth 30¢ a pound with 150 lb. worth 40¢ a pound. What is a pound of the mixed coffee worth?

3. A field containing $34\frac{1}{2}$ acres produced 1449 bushels of oats. What was the average yield per acre?

4. What will 6840 pounds of wheat sell for at $\$1.83\frac{1}{2}$ per bushel of sixty pounds?

5. If fruit loses $\frac{5}{8}$ of its weight in drying, how many pounds of fresh fruit will be necessary to make 1200 pounds of dried fruit?

6. (a) How many dresses containing $3\frac{1}{4}$ yards of cloth each can be made from 80 yards of cloth? (b) How much cloth will remain?

7. It requires $5\frac{5}{8}$ yards of cloth and $1\frac{1}{4}$ dozen buttons for one suit. (a) How many yards of cloth and (b) how many buttons will be required to make 56 suits?

8. A dealer bought a quantity of groceries which he sold at a gain of $\frac{1}{5}$ of the cost. (a) If the cost price was \$540, what was the gain? (b) What was the selling price?

Assignment 5B

1. *A* invested \$2500 in a business, and *B* invested \$3500. For the year the net profits were \$3600. How much should each receive in proportion to his investment?

2. Two farmers rent a pasture for 4 months for \$150. One puts in 8 head of cattle and the other puts in 12 head. What portion of the \$150 should each one pay?

3. A man bought a used automobile for $\frac{2}{5}$ of its first cost. He sold it for \$300, which was $\frac{1}{4}$ of its first cost. (a) What was the first cost? (b) How much did he pay for it?

4. A man failed in business with resources of \$12,400 and liabilities of \$18,600. (a) What fractional part of his liabilities were his resources? (b) How much could he pay a creditor whom he owed \$1500?

5. A young man spent \$480 for board and room; \$245 for clothes; \$60 for laundry; \$28 for shoes; and \$87 for incidentals. The amount he spent for these items was $\frac{5}{7}$ of what he earned during the year. (a) How much did he earn? (b) How much did he save?

6. A man sold a building lot for \$3000, at a loss of $\frac{1}{7}$ of its cost. (a) How much did he lose? (b) How much did he pay for the lot?

7. A butcher purchases turkeys, weighing a total of 660 lb., at 28¢ a pound. If $\frac{2}{5}$ of their weight was lost in dressing them, what did they cost per pound dressed?

8. A man sold $\frac{3}{5}$ of his interest in a lumber yard for \$12,300. (a) If he owned $\frac{2}{5}$ of the lumber yard, what part of the whole did he sell? (b) What was the value of the lumber yard?

Assignment 6A

1. A dealer bought a quantity of butter for \$127.50. By selling it at 60¢ a pound, he gained $\frac{1}{5}$ of its cost. How many pounds were there?

2. An agent earned \$540 by buying goods on a commission of $\frac{1}{20}$ of the net cost. (a) What was the net cost of the goods he bought? (b) What was the total cost?

3. A furniture dealer bought a chair and a table for \$216. The chair cost $\frac{1}{3}$ as much as the table. How much did each cost?

4. The following pieces were cut from a bolt of cloth containing $84\frac{3}{4}$ yd.; $3\frac{3}{4}$ yd.; $2\frac{1}{2}$ yd.; $7\frac{1}{8}$ yd.; $5\frac{3}{8}$ yd.; $9\frac{5}{8}$ yd.; $11\frac{3}{4}$ yd. (a) How many yards remained in the bolt? (b) What was the cloth remaining worth at 64¢ a yard?

5. A man owns $\frac{5}{8}$ of a coal mine worth \$240,000. (a) What part of his share could he sell for \$60,000? (b) What part of the mine would he still own?

6. A dealer bought 12 bu. of potatoes for \$2 a bushel. If $\frac{3}{4}$ bu. decayed, and he sold the good potatoes at a gain of \$3 on the whole cost, how much did he get for them per bushel?

7. A man walked the distance between two towns which were 48 miles apart. On the first day he walked $27\frac{1}{2}$ miles. What fractional part of the distance had he still to walk?

8. If a lot cost $\frac{4}{9}$ of the cost of the house on it, and both cost \$16,900, find the cost of each.

Assignment 6B

1. *A*, *B*, and *C* are partners in a business. *A* invested $\frac{3}{7}$ of the capital; *B*, $\frac{5}{14}$; and C, the remainder. The profits for the year were \$8400. In proportion to his investment, what was each partner's share of the profits?

2. A speculator bought $\frac{1}{2}$ of the shares of stock offered by a corporation. He sold $\frac{2}{5}$ of his shares. The par value of the shares he still owns is \$36,000.

What is the par value of the shares offered by the corporation? Prove your work.

3. There is an inlet by which a tank can be filled in 6 hours and an outlet by which it can be emptied in 9 hours. How long will it take to fill the tank, if both inlet and outlet are set running at the same time, provided the tank is empty at the start?

4. One man can do $\frac{1}{16}$ of a piece of work in one day. One boy can do $\frac{1}{32}$ of the same piece of work in one day. (a) How long will it take two men to do the work? (b) How long will it take a man and a boy to do the work?

5. The sales in the clothing department of a store amounted to $24,600 in one month, $2\frac{1}{6}$ times as much in the grocery department, and $1\frac{1}{20}$ times as much in the dry goods department. (a) Find the amount of the sales in each department. (b) Find the total sales.

6. A farmer bought a horse, a wagon, and a harness for $320. The harness cost $\frac{1}{2}$ as much as the wagon, and the horse cost $2\frac{1}{2}$ times as much as the wagon. How much did each cost?

7. After $\frac{3}{7}$ of the wheat in a bin had been sold, 1400 bu. remained. (a) How many bushels were in the bin? (b) How many bushels were sold? (c) What was the value of all the wheat at $\$1.66\frac{2}{3}$ a bushel?

8. A clerk's salary was $125 a month. His expenses were $\frac{3}{5}$ of his salary. During the time he was employed he saved $450. How long was he employed?

GENERAL PROBLEMS

Assignment 7A

1. Find the cost of 6 pieces of serge containing the following numbers of yards: 54^1, 53^3, 54^2, 50^1, 54^3, 57^2, at $\$1.44\frac{3}{4}$ a yard.

2. Find the cost of 45 bags of flour, each containing 7 lb., at 21 pounds for $1; 225 melons at $18 per hundred; 250 qt. of berries at 23¢ a quart; and 5 crates of eggs, 30 doz. in each crate, at $41\frac{1}{2}$¢ a dozen.

3. In a boarding house there were 30 boarders who paid, on an average, $14.25 per week for board. The weekly expenses were as follows: meat, 212 lb., at an average price of $36\frac{3}{4}$¢ a pound; vegetables, $43.60; butter, $56\frac{1}{2}$ lb. at 48¢ a pound; 21 doz. eggs at 47¢ a dozen; other articles of food, $134. The laundry cost $13.20; $78 was paid for help, and the rent of the house was $40. What was the profit or loss for one week?

4. A dealer paid $164 for cheese at 24¢ a pound; $305.50 for butter at 47¢ a pound; $126 for lard at 14¢ a pound; and $195 for eggs at 45¢ a dozen. How much of each did he buy?

5. A grocer's sales for the week were as follows: Monday, $184.60; Tuesday, $193.75; Wednesday, $178.40; Thursday, $188.15; Friday, $163.55; Saturday, $248.65. Find his average daily sales.

6. During three years a contractor contracted for and built the following pieces of road: the first, $5\frac{3}{10}$ miles; the second, $4\frac{2}{5}$ miles; the third, $3\frac{2}{3}$ miles; the fourth, $4\frac{4}{5}$ miles; the fifth, $7\frac{1}{30}$ miles; and the sixth, $6\frac{1}{10}$ miles. How many miles of road did he build?

7. A newsdealer buys each day 240 daily papers at $1.80 per hundred and sells them at 3¢ each. At the end of six days he had 28 papers left on hand. How much did he make during the week?

8. (a) If 6 dozen chairs cost $162, for how much per chair must they be sold to gain $9 per dozen? (b)What was the net gain if it cost $7\frac{3}{8}$¢ each to handle the chairs?

Assignment 7B

1. A contractor's price for building a house was $12,800. He allowed $\frac{1}{20}$ for supervision, $\frac{1}{4}$ for labor, $\frac{1}{5}$ for lumber, $\frac{1}{8}$ for other materials, $\frac{1}{10}$ for heating, $\frac{1}{20}$ for electrical wiring, $\frac{1}{10}$ for plumbing, and $\frac{1}{20}$ for painting. The difference was his profit. (a) How much did he allow for each item mentioned? (b) If his allowances were correct, how much would be his profit?

2. It cost a farmer $156 to produce 960 bu. of wheat. He paid $\frac{1}{3}$ of this amount for cultivation, $\frac{1}{6}$ for seed, $\frac{1}{8}$ for fertilizer, $\frac{1}{6}$ for help in harvest, $\frac{1}{8}$ for help in thrashing, and $\frac{1}{12}$ for incidentals. (a) How much per bushel did it cost him to produce this wheat? (b) How much did he pay for each item of expense? Prove your work.

3. It cost $1800 to drain a piece of low land. The cost for labor was $960; the rental cost for machinery was $360; the tile cost $270; the cement cost $150, and incidentals, $60. Find, to the lowest terms, the fractional part which each item is of the whole cost.

4. A merchant paid $190 a month rent for a store building. His profits for the year amounted to $9450. What fractional part of the profits for a year was the rent for the same period? (Reduce to lowest terms.)

5. *A*, *B*, and *C* are partners. *A* invested $2750, *B* invested $4125, and *C* invested $5500. What fractional part of the capital did each partner invest? (Reduce each fraction to its lowest terms.)

6. By selling a building lot for $1875 the owner lost $\frac{1}{3}$ of what he paid for it. (a) How much did he pay for the lot? (b) How much did he lose?

DECIMALS

Assignment 8A

1. If 4800 lb. of beef were sold for $1383.60, what was the average price per 100 pounds?

2. A certain article which cost $3.15 is sold for $4.25. How many of the same articles must be sold to gain $1320?

3. A man has .15 of his money invested in stocks; .45 in bonds, and the remainder deposited in savings banks. How much is he worth, if he has $24,800 in the banks?

4. Three men unite in a business venture. A puts in .22 of the money needed; B puts in .34, and C puts in \$18,260. How much did A and B each invest?

5. Find the freight on 18,970 lb. of cotton at 26¢ per hundredweight, and 24,360 lb. of furniture at \$.184 per hundredweight.

6. A dealer bought 1600 lb. of coffee at \$.28 a pound and 1600 lb. at \$.315 a pound. At what average price per pound should the whole quantity be sold to gain \$.0425 per pound?

Assignment 8B

1. A farmer exchanged 5 loads of wheat, weighing 12,240 lb., which was worth \$1.35 per bushel of 60 pounds, for 10 loads of lime weighing 30,600 lb. What was the price of the lime per 100 pounds? (Solve by cancellation.)

2. F, G and H formed a partnership. F invested \$15,000; G invested \$18,000, and H invested \$12,000. (a) What decimal part of the capital did each one invest? (b) What part of \$8500 profit should each partner receive, according to his investment?

3. Two men joined in the purchase of a piece of property. One paid .35 of the purchase price, and the other the remainder. The property was sold at a profit of \$4800, and the one who paid .35 of the purchase price received \$14,000 for his share of the amount received for the property. (a) How much did they pay for the property? (b) How much did each man make?

4. The total expenses for operating a bus line for one month were \$18,960. The expenses were divided as follows: gas and oil, 13.25 hundredths; repairs, 17.75 hundredths; wages of drivers, 28.50 hundredths; advertising, 11.50 hundredths The remainder was charged to depreciation. What was the amount of depreciation?

5. In a certain city of 43,400 inhabitants, the tax budget was \$843,290. Find to the nearest cent the cost per inhabitant of running the city.

6. In a certain city, with a population of 140,000, there were 1540 deaths and 3112 births. Find to the nearest tenth (a) the number of deaths and (b) the number of births per thousand inhabitants.

DENOMINATE NUMBERS

Assignment 9A

1. A dealer bought 18 bu. and 3 pks. of onions for \$2 a bushel and sold them for 10¢ a quart. How much did he gain?

2. A merchant bought 16 bu. of potatoes, from which he sold the following amounts: 2 bu., 2 pk.; 1 bu., 3 pk.; $1\frac{1}{2}$ pk.; 2 qt.; 4 bu.; 3 bu., 2 pk., 2 qt.; 2 bu. 2 pk., 1 qt. How many bushels had he left?

3. During six days a milk dealer delivered the following quantities of milk: 32 gal., 3 qt., 1 pt.; 28 gal., 2 qt.; 29 gal., 1 qt., 1 pt.; 35 gal., 3 qt., 1 pt.; 31 gal., 2 qt.; 36 gal., 3 qt., 1 pt. How much did he receive for the milk, if it was sold for $12\frac{1}{2}¢$ a quart?

4. How much was made by buying 40 gal. of syrup for 80¢ a gallon and selling it for 35¢ a quart?

5. A man worked 5 hours and 35 minutes one day, and 6 hours and 25 minutes the next day. If there are 8 hours in a working day, what part of the full time did he work?

6. In a bicycle race, one rider rode 52 hours, 25 minutes. How many working days of 8 hours each did he ride?

7. Find the cost at 90¢ per cwt. of four loads of bran weighing as follows: 1 T., 3 cwt., 40 lb.; 2 T., 90 lb.; 2 T., 5 cwt., 75 lb.; 1 T., 8 cwt., 25 lb.

8. An exporter sold 25,000 bu. of wheat for £10,277, 9s., 10d. How much per bushel did he receive in United States money?

Assignment 9B

1. A manufacturer made 1 gross of silver salt-cellars, each weighing 8 pwt., 12 gr. How much did the silver used in making these salt-cellars cost him at $1.20 per ounce, avoirdupois?

2. How much will be the freight charges, at $7\frac{1}{2}¢$ per 100 pounds, on 3400 bu. of wheat and 2860 bu. of rye?

3. Find the cost, at 24¢ a rod, of the wire necessary to enclose a field 420 rd., 11 ft. long, and 340 rd., 8 ft. wide, with a fence five wires high?

4. A party went by auto bus to Florida. The first day they traveled 9 hr., 45 min.; the second day, 10 hr., 20 min.; the third day, 11 hr., 35 min.; and the fourth day, 8 hr., 28 min. (a) How long did it take them to make the trip? (b) How far did they travel, if they averaged 23.3 miles per hour?

5. A farmer sold to a milk dealer at one time 12 gal., 2 qt., 1 pt. of milk; at another time, 15 gal., 1 qt., 1 pt.; and at still another time, 18 gal., 3 qt.—all at 24¢ a gallon. How much did the dealer make, if he sold it at 12¢ a quart?

6. A man owned a piece of land containing 31 A., 28 sq. rd., 15 sq. yd., 5 sq. ft., from which he sold a piece containing 12 A., 80 sq. rd., 9 sq. yd., 6 sq. ft. How much land had he left?

7. A farmer raised 480 bu., 2 pk., 4 qt. of wheat from 12 bu. of seed. How much did one bushel of seed yield?

8. Find the cost of 12 lb., 8 oz. of butter at 56¢ a pound; 15 lb., 9 oz. of lard at 13¢ a pound; 11 lb., 6 oz. of beef at 42¢ a pound; 16 lb., 12 oz. of pork at 38¢ a pound.

Assignment 10A

1. A parcel of land having a street frontage of 266 ft., 8 in., was divided into five lots. How many feet of frontage were there in each lot?

2. (a) How many cans holding 1 gal., 2 qt. each can be filled from a vat holding 145 gal., 2 qt.? (b) How much was made by selling the whole quantity at a profit of 12¢ a quart?

3. A dealer bought 3 kegs of vinegar, each containing 9 gal., 1 qt., 1 pt., at 7¢ a qt; and 5 kegs of syrup, each containing 8 gal., 3 qt., at 64¢ a gallon. How much was his bill?

4. Find the cost, at $12 per ounce, of three packages of drugs of the following weights: 2 lb., 5 oz., 4 dr., 2 sc., 8 gr.; 3 lb., 4 oz., 5 dr., 1 sc., 10 gr.; 5 lb., 8 oz., 7 dr., 2 sc., 9 gr.

5. A coal dealer bought 8 carloads of coal, containing in all 568,840 pounds. (a) How many long tons were there in the 8 carloads? (b) How many short tons?

6. Find the sum of 11 Km., 5 Hm., 3 m., 2 dm.; 7 Km., 2 m., 3 dm.; 4 Km., 3 Hm., 7 dm.

7. How many feet are there in 12 pieces of cable, each 4 rd., 3 yd., 2 ft., 7 in. long?

8. A dealer bought 2 dozen silver forks, each weighing 4 oz., 6 pwt., 12 gr. What did they cost at 7¢ a pennyweight?

Assignment 10B

1. A certain roadway is 400 rods long and contains 10 acres. How wide is it?

2. Find how much it will cost, at $1.80 a rod, to enclose a field 420 rd., 3 yd. long and 280 rd., 2 yd. wide with a wire fence.

3. What decimal part of a mile, correct to four decimal places, is 80 rd., 3 yd., 2 ft.?

4. Find the cost of 8 casks of syrup, each containing 37 gal., 2 qt., 1 pt., at 85¢ a gallon; and 16 bags of potatoes, each containing 2 bu., 1 pk., 4 qt., at $1.75 a bu.

5. An automobile wheel is 1 yd., 1 ft., 9 in. in circumference. If it makes 10 revolutions per second, how far will it travel in 1 hour? (Express your answer in miles.)

6. (a) How many city lots, each 50 ft. by 100 ft., can be laid out on a plot of land containing $4\frac{1}{2}$ acres, if 6020 sq. ft. are taken for sidewalk? (b) If the land was bought for $400 an acre and sold for $250 a lot, how much was gained?

7. How much was gained on 5 cars of coal, weighing 22 long tons each, bought at \$5.85 a long ton and sold at \$7.75 a short ton?

8. A merchant bought 350 m. of silk at 95¢ a meter and sold it for \$1.45 a yard. How much did he gain?

REVIEW

Assignment 11A

1. Reduce (a) 3 pk., 2 qt. to the decimal of a bushel; (b) 3 yd., 2 ft. 6 in. to the fraction of a rod.

2. (a) What fractional part of a gallon are 2 qt., 1 pt.? (b) How many quarts, liquid measure, will equal 40 qt., dry measure?

3. If it takes 30 men, working 8 hr. a day for 25 days, to complete a piece of work, how long will it take 40 men to complete the same piece of work?

4. A speculator bought two houses for \$16,800; $\frac{3}{4}$ of the cost of one house was equal to the cost of the other. How much did he pay for each house?

5. Find the difference in yards, feet, and inches between 1280 yards and 1060 meters.

6. A roadway is 3870 feet long. What decimal part of a mile is the length of this roadway? (Carry the result to four decimal places.)

7. How many square rods are there in a flower bed containing 127.05 square yards? (30.25 sq. yd. in a sq. rd.)

8. A party of tourists motored 2500 Km. in France. How many miles did they motor?

Assignment 11B

1. A merchant finds that he can buy a certain article in France for 121 francs, and that in England he can buy the same article for 19s. What would be the difference in the cost, in United States money, of 40 doz. of these articles? (1 franc is equal to \$0.0391$\frac{3}{4}$, and 1 shilling, to \$0.2433$\frac{1}{4}$.)

2. If it takes 50 men, working 10 hours a day, 70 days to complete a piece of work, how many men working 8 hours a day will be required to do the same work in the same time?

3. Three dairymen rented a pasture at \$30 per month for 3 months (90 days). *A* put in 15 cows for 40 days; *B* put in 20 cows for 60 days, and *C* put in 12 cows for 90 days. How much should each pay?

4. *D* and *E* are partners. *D* invests \$12,000 for 12 months, and *E* invests \$8000 for 9 months. The net profit for the year was \$3840. Find each partner's share of the profit, in proportion to his average investment.

5. A French exporter offered to sell candy in the United States for 65¢ a kilogram. An American importer offered the same candy for 40¢ a

pound. The difference in price was equal to the duty. How much was the duty on 500 pounds? (1 lb., avoirdupois, equals .4536 kilograms, or 1 kilogram equals 2.2046 lb.)

6. A certain grade of silk can be bought in France for 50.5 francs per meter. The same grade of silk can be bought in Germany for 7.75 marks per meter. What would be the difference in price on a purchase of 1000 meters? (Express the amount in United States money.)

7. How many grains of pure gold will be required to make 10 dozen 10-karat pins, weighing 4 pwt., 6 gr. each? ("10-karat" means $\frac{10}{24}$ pure gold.)

8. (a) Reduce $\frac{5}{8}$ of a day (24 hours) to hours. (b) Change 15 hr., 20 min. to a fraction of a day.

MEASUREMENTS

Assignment 12A

1. (a) How many square feet are there in a field 1450 ft. by 900 ft.? (b) Square yards? (c) Square rods?

2. Find the square root of (a) 9025; (b) 15,376.

3. Find the area of a plot 320 ft. by 460 ft. in (a) square feet; (b) in square yards. (c) Find the perimeter of the same plot in yards.

4. (a) Find approximately the weight of the water in a tank that contains 840 gallons. (b) What is approximately the cubic capacity of this tank in cu. ft. and cu. in.? (A gallon of water weighs about $8\frac{1}{3}$ lb., and a cu. ft. is equal to approximately $7\frac{1}{2}$ gal.)

5. A merchant bought silk at 90¢ a meter and sold it at $1.15 a yard. How much was his profit on 1500 yards? (A yard is equal to .9144 of a meter. A meter is equal to 1.0936 yards.)

6. Find how much it will cost, at $3.60 a rod, to enclose a square field containing 40 acres.

7. Find the cost, at $1.50 a square yard, of building a sidewalk 5 ft. wide and 280 ft. long.

8. In a certain field there are 340 acres. If the field is 200 rods wide, how long is it?

Assignment 12B

1. The base of a right triangle is 120 ft., and the altitude is 160 ft. How many square feet are there in the area?

2. (a) How many acres are there in a farm 240 rd. long and 180 rd. wide? (b) What will it cost to fence this farm at $3.60 a rod?

3. Find the cost, at 75¢ a square yard, of painting the four walls and the ceiling of a room 24 ft. long, 18 ft. wide, and 8 ft., 6 in. high, allowing for 3 windows, 3 ft. by 5 ft., 6 in., and 2 doors, 3 ft. by 7 ft.

4. Find the cost, at 55¢ a square foot, of building a sidewalk 4 ft. wide around the outside of a city block 800 ft. long and 250 ft. wide.

5. A square field contains 10 acres. Find the cost of enclosing it with a fence at a cost of $4.75 a rod.

6. The approximate capacity of a bin 20 ft. long and 6 ft. wide is 600 bu How deep is the bin? ($\frac{4}{5}$ of a bushel equals about 1 cu. ft.)

7. Find the cost, at 60¢ a square yard, of plastering the walls and ceiling of a room 26 ft., 6 in. long, 15 ft. wide, and 9 ft. high, allowing $\frac{1}{6}$ of the surface of the walls for doors, windows, and baseboard.

8. Find the cost, at $76 per M. of the lumber for a floor 24 ft., 6 in. by 18 ft., 4 in., if $\frac{1}{8}$ is allowed for waste in matching.

Assignment 13A

1. (a) How many acres are in a rectangular field 80 rd. wide and 240 rd. long? (b) How much was this field sold for per acre, if the price received was $2880?

2. A farm 120 rd. long contains 60 acres. How many rods wide is this farm?

3. (a) Find the number of acres in a rectangular field $\frac{1}{4}$ mile long and 60 rd. wide. (b) How much will it cost to fence this field at $1.90 a rod?

4. Find the perimeter of a square field that contains 40 acres.

5. The sides of a triangle measure 20 ft., 30 ft., and 40 ft., respectively. Find the area.

6. What will it cost, at 28¢ per square yard, to paint the four sides of a garage 20 ft. long, 18 ft. wide, and 9 ft. high?

7. Find the cost of painting the walls of a kitchen 12 ft. long, 10 ft. wide, and 8 ft., 6 in. high, at 35¢ a square yard.

8. How much will it cost, at 45¢ per square foot, to lay a cement walk 4 ft. wide on two sides of a corner lot 50 ft. by 100 ft.? (The lot measurements are the inside measurements of the walk.)

Assignment 13B

1. What will it cost, at 27$\frac{1}{2}$¢ a square yard, to paint the sides of a barn 72 ft. long, 36 ft. wide, and 18 ft. high to the rafters, and two gable ends 9 ft. to the ridgepole?

2. How much will it cost, at $3.80 per square yard, to build a cement walk 4 ft. wide on the outside of a corner lot 25 ft. by 100 ft.?

3. How much will it cost, at \$1.40 per square yard, to plaster the side walls and ceiling of a room 20 ft. long, 18 ft. wide, and 8 ft. high, if $\frac{1}{4}$ of the wall space is allowed for openings?

4. (a) How many board feet of plain boards will be required to make 40 six-sided boxes 4 ft. long, 3 ft. wide, and 2 ft. high? (b) How much will the boards cost at \$36 per M.?

5. Find the number of square yards in a plot the shape of a trapezoid, the parallel sides being 120 ft. and 100 ft., and the distance between the sides being 40 ft.

6. Find the cost, at 45¢ a square yard, of roofing material for the two sides of a barn roof 75 ft. long and 18 ft. from the eaves to the ridge.

7. If eight bricks will lay one square foot, find the cost, at \$16 per M, of the brick to pave a court which measures 34 ft. by 40 ft.

8. A plot 150 ft. long and 120 ft. wide is enclosed with a tight board fence 6 ft. high. At 30¢ per square yard, how much will it cost to paint the fence on both sides?

Assignment 14A

1. Find the volume of a solid block of marble 3 ft. long, $2\frac{1}{2}$ ft. wide, and $1\frac{1}{2}$ ft. thick.

2. Find the volume of a cylinder 3 ft. in diameter and 6 ft. high.

3. A water tank 12 ft. in diameter and 24 ft. deep is filled with water, how many gallons approximately does it hold? ($7\frac{1}{2}$ gal. equal about 1 cu. ft.)

4. Find the cost, at 30¢ per square foot, of sheet metal for a pipe 18 inches in diameter and 12 ft. long. (Find the nearest whole number of square feet.)

5. What will it cost, at 28¢ per square yard, to paint the outside of a tank 5 ft. in diameter and 16 ft. long? (Find the nearest whole number of square yards.)

6. How many rods will a wheel, 28 inches in diameter, go in making 800 revolutions?

7. The volume of a prism 2 ft. long is 2400 cu. in. Find the size of its base.

8. The diameter of a cylinder is 4 ft. and its volume is 75.4 cu. ft. Find its length.

Assignment 14B

1. A tank is 12 ft. long, 4 ft. wide, and 3 ft., 6 in. deep, by inside measurement. (a) How many gallons approximately will it hold? (b) How long will it take to empty this cistern at the rate of 15 gallons a minute? (1 cu. ft. is equal to about $7\frac{1}{2}$ gal.)

2. The circumference of an oil tank is 44 ft. and its depth is 16 ft. How many gallons will it hold? (44 ÷ $3\frac{1}{7}$ = diameter.)

3. (a) How many square feet of sheet iron will be required to make 14 sections of pipe 18 in. in diameter and 6 ft. long, allowing $\frac{3}{4}$ in. for seams? (b) What will it cost at 94¢ a square yard?

4. A cistern that holds 12,900 gallons of water is 16 ft. long and 15 ft. wide. How deep is it? ($7\frac{1}{2}$ gal. equal approximately 1 cu. ft.)

5. In excavating for a cellar, 224 cubic yd. of earth and rock were removed. (a) If the cellar was 36 ft. long and 6 ft. deep, how wide was it? (b) If the rock was equal to $\frac{1}{4}$ of the excavation, how many cubic yards of earth were there?

6. How many cubic feet of masonry are there in the four walls under a building 96 ft. long, 48 ft. wide, 8 ft. high, and $1\frac{1}{2}$ ft. thick, deducting 560 cu. ft. for openings and 72 cu. ft. for the corners?

7. The gable ends of a barn are 42 ft. wide and 16 ft. from cornice to ridgepole. At $45 per M., find the cost of the boards necessary to cover both ends. Add $\frac{1}{12}$ for waste in cutting. (As the boards are one inch thick, a square foot is equal to a board foot.)

8. The height of a building is 32 ft. to the eaves. How long will a ladder, set 13 ft. out from the wall, need to be to reach to the eaves?

Assignment 15A

1. Find the cost, at $1.20 per square yard, of plastering the walls and ceiling of a room 15 ft. long, 12 ft. wide, and 8 ft. high. Allow 50 sq. ft. for openings.

2. (a) How many yards of carpet 30 in. wide will be required for a room 24 ft. long and 15 ft. wide? (b) What will it cost at $1.75 per yard? (Lay the strips the long way of the room and allow 2 yards for matching.)

3. How many double rolls of paper will be required to paper the side walls of a room 15 ft. long, 12 ft. wide, and 8 ft. high, allowing for 1 door 3 ft. wide and 2 windows 3 ft. wide?

4. Find the total cost of the following lumber:

120 pieces 2″ by 8″, and 16′ long, at $54 per M.
312 pieces 2″ by 4″, and 14′ long, at $55 per M.
70 pieces 2″ by 6″, and 18′ long, at $48 per M.

5. (a) How many cords of wood are there in a pile 80 ft. long, 4 ft. wide, and 4 ft. high? (b) What is it worth at $9.60 per cord?

6. (a) How many bushels of wheat approximately are there in a bin 10 ft. long, 8 ft. wide, and 7 ft. deep? (b) How much is it worth at $1.48 a bushel? (2150.42 cu. in. in a bu., or 1 cu. ft. equals approximately $\frac{4}{5}$ (.8) of a bushel.)

7. (a) How many gallons of water approximately will a cistern hold that is 8 ft. square and 6 ft. deep? (b) How long will it take to fill this cistern at the rate of 20 gallons per minute? (231 cu. in. in a gal. or 1 cu. ft. equals approximately $7\frac{1}{2}$ gal.)

8. A rectangular field is 160 rd. long and 90 rd. wide. (a) How long would a field of the same area be if it were 60 rd. wide? (b) How many acres are there in each field?

Assignment 15B

1. A room 20 ft. long, 14 ft. wide, and 8 ft. high, has 4 windows 3 ft. by 5 ft., 6 in., and 2 doors 3 ft. by 7 ft. Find the cost of plastering the walls and ceiling at \$1.40 per square yard. Allow $\frac{1}{2}$ only of the openings.

2. Find the cost, at \$2.25 a yard, of carpet 27 in. wide, for 2 rooms of the following sizes: 18 ft. by 12 ft., and 15 ft. by 12 ft. The carpet should be laid lengthwise of the room.

3. Find the cost, at \$1.80 per roll, of papering the walls of a room 22 ft. long, 18 ft. wide, and $8\frac{1}{2}$ ft. high. Allow for 2 windows 3 ft. wide and 1 door 4 ft. wide. (The price is per single roll of 24 ft.)

4. A square field contains 40 acres. (a) How many rods of fence will be required to divide this field into two fields of 20 acres each, and enclose each field? (b) How much will it cost at \$1.30 per rod?

5. A solid piece of stone masonry is 6 ft. on a side and 8 ft. high. (a) What is its volume in cubic ft., and (b) how many square feet are there in the surfaces of its six sides?

6. A pyramid is 8 ft. square at its base and 12 ft. in altitude. Find its volume in cubic feet.

7. How high is a pyramid which has a volume of 14,400 cu. ft. and a base 24 ft. square?

8. A cylindrical cistern 7 ft. deep and 6 ft. in diameter will hold how many gallons?

Assignment 16A

1. Find the circumference of a circle having a radius of 12 ft.

2. Find the area of a circular park having a diameter of 60 rd.

3. Find the hypotenuse and the area of a right-angled triangle whose base is 30 ft. and whose altitude is 20 ft.

4. Find the base and the area of a right-angled triangle whose hypotenuse is 40 yd., and whose altitude is 24 yd.

5. Find the altitude and the area of a right-angled triangle whose hypotenuse is 45 ft. and whose base is 36 ft.

6. Find the volume in cubic feet of a square prism whose base is 9 ft. on a side and whose altitude is 12 ft.

7. Find the volume in cubic feet of a cylinder whose diameter is 4 ft and whose altitude is 16 ft.

8. Find the volume of a triangular prism whose base is 4 ft. by 5 ft. by 3 ft., and whose altitude is 12 ft.

Assignment 16B

1. Find the cost of a pile of wood 44 meters long, 2 meters wide, and 2 meters high, at 12.5 francs a stere (cubic meter).

2. How much will it cost, at \$2.50 a yard, to carpet a room 22 ft. long and 18 ft. wide, with carpet 27 inches wide, if $2\frac{1}{2}$ yards are allowed for matching?

3. A bin filled with wheat measures 6 meters long, 2 meters wide, and $1\frac{1}{2}$ meters high. How many hectoliters of wheat are contained in this bin?

4. A piece of ice 300 ft. long and 100 ft. wide is cut from a lake covered with ice 10 inches thick. What is the cost of removing this ice at \$1.50 per ton? (A cubic foot of solid ice weighs $57\frac{1}{2}$ pounds.)

5. Find the cost, at \$16 per M., of brick for a cellar wall. The wall is to be 1 ft. thick and 7 ft. high, and when completed, the cellar will be 39 ft. long and 19 ft. wide inside the wall. Allow $\frac{1}{6}$ for mortar and $\frac{1}{8}$ for openings. (A standard brick is $2'' \times 4'' \times 8''$.)

6. The roof of a barn is 48 ft. long and 22 ft. from eaves to ridge. Find the cost, at \$6.75 per M., of covering the two sides of this roof with shingles 4 in. wide and laid 6 in. to the weather.

7. A circular standpipe is 60 ft. high and 12 ft. in diameter. When filled to $\frac{2}{3}$ of its height, how many gallons of water does it contain, allowing $7\frac{1}{2}$ gallons to a cubic foot?

8. A lot is 150 ft. long and 125 ft. wide. A cement walk $3\frac{1}{2}$ ft. wide was built around the outside of this lot. How much did the walk cost at \$4.25 a square yard?

Assignment 17A

1. (a) How many long tons are there in three carloads of coal weighing 228,480 pounds? (b) What is it worth at \$7.85 per long ton?

2. Find the cost of flooring, at \$75 per thousand feet, for a room 36 ft. long and 28 ft. wide, allowing $\frac{1}{6}$ for matching.

3. What part of an acre is a square plot that measures 60 ft. on a side?

4. Find the approximate capacity in gallons of a rectangular tank 8 ft. long, $2\frac{1}{2}$ ft. wide, and $1\frac{1}{2}$ ft. deep, inside measurements. (1 cu. ft. equals approximately $7\frac{1}{2}$ gal.)

5. At \$56 per thousand feet, find the cost of 2 boards 18 ft. long, 10 in. wide, and 1 in. thick.

6. Find the volume of a cone whose base is 4 ft. in diameter, and whose altitude is 12 ft.

7. Find the diameter of the base of a cone whose altitude is 9 ft. and whose volume is 58.905 cu. ft.

8. A cylinder 20 ft. long has a volume of 1570.8 cu. ft. Find the diameter.

Assignment 17B

1. A dealer bought 336,000 lb. of coal, at \$7.80 per long ton, and sold it at \$12.50 per short ton. If the freight and cartage amounted to \$788, how much did he gain?

2. A room 22 ft. long and 18 ft. wide is floored with oak flooring costing \$120 per thousand square feet. Find the cost, reckoning labor and nails at \$28.80, and allowing 120 square feet per 1000 for waste in matching.

3. A circular grass plot in a city square has a radius of 100 ft. (a) How many square feet are there in its area? (b) What fractional part of an acre is this plot?

4. A rectangular tank is 6 m. long, 5 m. wide, and 2.5 m. deep. How many hours will it take to fill this tank with water at the rate of 1000 liters per minute? (1000 cu. dm. equal 1 cu. m., 1 liter equals 1 cu. dm.)

5. At \$4.50 per square yard, how much will it cost to build a cement walk 4 feet wide on the outside corner of a city block 250 feet by 500 feet?

6. In a certain section the rainfall during a season was 8 in. How many gallons approximately, of water fell on a watershed the area of which is 20 miles square? ($7\frac{1}{2}$ gal. equal approximately 1 cu. ft.)

7. Find the approximate capacity in gallons of a circular water tank 15 ft. in diameter and 80 ft. high, inside measurements.

8. Find the cost, at 40¢ a square yard, of painting the sides of a circular tank 12 ft. in diameter and 30 ft. high, outside measurements. (Find the nearest whole number of square yards.)

Assignment 18A

1. A tract of 10 acres of land was laid out in building lots. After deducting 600 sq. ft. for an approach at one corner, there were 87 lots. What was the size, in square feet, of each lot?

2. The land in the above problem was bought for \$500 an acre, and the lots were sold for \$200 each. (a) How much was gained? (b) If each lot is 100 ft. deep, how wide is it?

3. How many bushels of wheat can be put into a bin 12 ft. long, 6 ft. wide, and 5 ft. deep? (The bin is filled to cubic capacity only. 1 cu. ft. equals approximately $\frac{4}{5}$ (.8) of a bushel.)

4. Find the cost of inch boards, 12 ft. long, and 2 pieces $2'' \times 4'' \times 10$ ft. long at \$48 per M., needed to build the bin mentioned in the preceding problem. The bin has sides and bottom, but no top. Boards, either 12″ or 6″ wide, can be used without any waste.

5. Find the cost, at \$3 a cubic yard (27 cu. ft.), of stone for a cellar wall under a house 42 ft. by 30 ft., the wall being 7 ft. high and 15 in. thick. (In estimating, the nearest whole number of cu. yd. is usually figured.)

6. How many cubic feet of masonry are in a cellar wall the inside measurements of which are 38 ft. long, 26 ft. wide, and $6\frac{1}{2}$ ft. high, the wall being $1\frac{1}{2}$ ft. thick?

7. Find the cost, at \$14 per M., of the brick needed to build a brick wall, 3 ft. high and 12 in. thick, on the outside of two sides of a corner lot 100 ft. by 100 ft. Allow 22 bricks for each cubic foot of wall and 34 bricks extra for breakage.

8. A cistern 6 ft. deep is square and holds approximately 2880 gallons. How many feet are there in each of the other two dimensions? ($7\frac{1}{2}$ gal. equal approximately 1 cu. ft.)

Assignment 18B

1. A tract of land was bought for \$3500 an acre and, after 71,200 square feet were set apart for sidewalks on two sides, it was divided into 160 building lots 50 feet by 100 feet. The promoters spent \$22,000 for improvements and advertising and sold the lots at an average price of \$800 per lot. How much did they gain?

2. The contents of a tank filled with water weighed 24,000 lb. The tank is square and is 6 feet deep. What are the other dimensions? (A cubic foot of water weighs $62\frac{1}{2}$ lb.)

3. There were 7200 cu. ft. of earth removed in excavating a cellar 6 ft. deep. (a) If the cellar is 30 ft. wide, how long is it? (b) How much will be the cost, at \$11.50 a cubic yard, of stone to build a wall 12 in. thick for this cellar, if $\frac{1}{6}$ is allowed for mortar? (In estimating, approximately the nearest whole number of cu. yd. is usually figured.)

4. A sheet metal tank holds approximately 225 gallons of oil. If it is 3 ft. wide and $2\frac{1}{2}$ ft. deep, how long is it?

5. Find the total cost of the following bill of lumber:

150 pc. pine	$2'' \times 6'' \times 12'$	at \$48 per M.
60 pc. hemlock	$2'' \times 8'' \times 16'$	at \$44 per M.
120 pc. spruce	$2'' \times 10'' \times 14'$	at \$52 per M.

6. Find the cost, at 36¢ per square yard, of plastering the walls and ceiling of a room 26 ft. long, 18 ft. wide, and 8 ft., 6 in. high, allowing $\frac{1}{2}$ for 3 windows $3' \times 6'$ and 2 doors $3' \times 7'$.

7. (a) How many yards of carpet, 1 yd. wide, will be required to cover a floor 22 ft. long and 18 ft. wide, if the strips run lengthwise of the room and 6 in. are allowed on each strip for matching? (b) Find the cost at $2.85 per yard.

8. A room 24 ft. long, 16 ft. wide, and 8 ft. high, has 2 doors 3 ft. wide and 4 windows 3 ft. wide. At $2.20 per double roll, what will it cost to paper this room, if the decorator charges 80¢ per single roll for his services?

Assignment 19A

1. The altitude of a triangle is 18 ft. and the base is 14 ft. Find the area.

2. Find the base of a triangle whose hypotenuse is 50 ft. and whose altitude is 40 ft.

3. The base of a triangular plot is 80 ft. and the hypotenuse is 100 ft. Find (a) the altitude, and (b) the area.

4. The hypotenuse of a triangle is 5 yd. and the altitude is 3 yd. Find (a) the base in yards, and (b) the area in square yards.

5. A farm is one mile square. (a) How many acres does it contain? (b) How much will it cost to enclose this farm with a fence at a cost of $1.60 per rod?

6. A pile of 4 foot wood is 128 ft. long and contains 24 cords. (a) How high is it? (b) What will it cost to cut it into 2 foot lengths at $1.40 a cord? (128 cu. ft. are equal to 1 cord.)

7. A lot contains 605 sq. yd. (a) What part of an acre is it? (b) What is it worth at $5000 an acre?

8. From 8 sq. mi. of land, 3200 acres were sold. (a) How many acres remained? (b) How many square miles of land remain?

Assignment 19B

1. (a) How many acres of land are there in a township 6 miles square? (b) There is a highway around each section of land. How many miles of road are there in the township?

2. Find the cost, at $14.80 per cord, of a pile of wood 75 ft. long, 3 ft. wide, and 5 ft. high.

3. A coal dealer's sales for 10 days were as follows: 18,800 lb.; 26,200 lb.; 35,400 lb.; 34,600 lb.; 21,400 lb.; 28,500 lb.; 28,700 lb.; 30,200 lb.; 23,600 lb.; 30,100 lb. (a) How many tons of 2000 lb. each did he sell? (b) How much did he get for the coal at $14.50 per ton?

4. From a plot of land 140 rd. long and 80 rd. wide the owner sold 20 acres for $9600. At that rate, what is the whole plot worth?

5. A factory operates on a basis of 40 hours a week, regular time, and allows time and half-time for overtime. Find the wages of the following

employees: Barrow, 40 hr. at 90¢ per hr. and 8 hr. overtime; Gates, 32 hr. at $1.10 per hr. and 6 hr. overtime; Lowery, 36 hr. at 90¢ per hr. and 7 hr. overtime; Tanner, 30 hr. at $1.10 per hr. and 6 hr. overtime; Small, 40 hr. at 88¢ per hr. and 12 hr. overtime.

6. Find the cost of the following lumber at $55 per M.:

75	pieces of	Spruce	$2'' \times 8'' \times 16'$
78	"	Pine	$2'' \times 4'' \times 14'$
48	"	Hemlock	$4'' \times 8'' \times 18'$
65	"	Spruce	$2'' \times 6'' \times 16'$
240	"	Pine	$1'' \times 10'' \times 12'$
45	"	Hemlock	$6'' \times 8'' \times 18'$

Assignment 20A

1. A cylindrical tank 4 ft. in diameter and 6 ft. deep is full of oil. How many gallons approximately does it contain?

2. The volume of a square prism is 144 cu. ft. It is 4 ft. wide and 4 ft. thick. How long is it?

3. A cylinder 8 ft. long has a radius of 2 ft. How many cu. ft. are there in its volume?

4. The volume of a cylinder 3 ft. in diameter is 63.6174 cu. ft. How long is it?

5. How many square feet of surface are there in a cylindrical tank 6 ft. in diameter and 12 ft. long?

6. How much will it cost to paint the outside of 3 six-sided boxes, 3 ft. wide, 4 ft. high, and 5 ft. long, at 30¢ per square yard?

7. What is the volume of a cone, if its base is 9 in. in diameter and its altitude is 18 in.?

8. The base of a cone is 10 in. in diameter and its volume is 392.7 cu. in. Find its altitude.

Assignment 20B

1. What is the area in square feet of the entire surface of a prism 2 ft. square and 10 ft. long?

2. Find the entire surface of a cylinder which is 18 ft. long and has a diameter of 6 ft. (Express result in the nearest whole number of square feet.)

3. A tank, the sides of which are 2 in. thick, is 6 ft. wide and 5 ft. deep, inside measurement. It holds approximately 3000 gallons. Find its approximate length, outside measurement.

4. A room in a house is 24 ft. long by 18 ft. wide. The $2'' \times 4''$ studdings are set 18″ to center. (a) How many studdings will it take for

the 4 walls of this room, allowing 6 studdings less for the openings? (b) If each studding is 9 ft. long, how much will they cost at $55 per M.? (Allow one studding extra for each corner.)

5. A square bin 8 ft. deep is built to hold 1440 bu. of wheat. Approximately how long and how wide is this bin? (1 cu. ft. equals approximately $\frac{4}{5}$ (.8) of a bushel.)

6. A recitation room in a school building is 32 ft. long, 24 ft. wide, and 14 ft. high. (a) How many square ft. are there in the walls and ceiling? (b) What is the pupil capacity of the room, allowing 15 square feet of floor space per pupil?

7. Find the cost of enclosing a square field containing 10 acres with a fence, at the rate of $2.25 per rod.

8. A garden contains $\frac{1}{2}$ acre, and its length is 16 rd. How wide is it?

PERCENTAGE

Assignment 21A

1. A merchant sold 300 lb. of butter. For 60% of it he received 48¢ a pound, and for the remainder he received 45¢ a pound. How much did he receive for the butter?

2. A dealer sold 120 bbl. of potatoes for $684. If he received $6 per barrel for 40% of the potatoes, how much did he receive a barrel for the remainder?

3. A dealer bought 400 lb. of coffee at 40¢ a pound and 300 lb. of coffee at 36¢ a pound. He sold the coffee at a gain of 25% of the cost. How much did he receive for it?

4. A debtor settled with a creditor whom he owed $400 by paying him 85¢ on a dollar. How much did the creditor lose?

5. Find the discount and net amount of a bill for $1245, on which a discount of 8% is allowed.

6. A dealer bought a suite of damaged furniture for $240. He spent 20% of its cost in having it repaired, and sold it at a gain of 50% on the entire cost. How much did he gain?

7. A man who received a salary of $250 a month used 70% of it for his living expenses. How much did he save in 12 months?

8. In a school there were 320 boys and 15% more girls than boys. How many pupils were in the school?

Assignment 21B

1. A dealer bought 900 bu. of potatoes for $1.40 a bushel. During the time he kept them 10% decayed. He sold the good potatoes for an average of $1.95 a bushel. Did he gain or lose, and how much?

2. A dealer bought 560 bbl. of apples for $2380. He sold 65% of them for $5.50 a barrel, and the remainder for $5.25 a barrel. How much did he gain?

3. A debtor failing in business settled with his creditors for 66¢ on a dollar. To one creditor he owed $422.60, and to another he owed $765.50. How much did each creditor lose?

4. A farm contained 240 acres, of which 30% was woodland and pasture, 25% was meadow, 15% was planted in small grains, and the remainder in corn. How many acres were planted in corn?

5. During a season a salesman traveled 3480 miles. He traveled 77½% of this distance on trains and the rest by automobile. How far did he travel by automobile?

6. A man's salary was $4000 per year. He spent 22½% for rent, 28% for food and clothes, and 18% for incidentals. (a) How much did he spend for each item? (b) How much did he save?

7. From a farm containing 640 acres, 37½% was sold for $36,000. At that rate, what is the whole farm worth?

8. A man had $4800 on deposit in a savings bank. At one time he drew out 15%, and at another time 30% of what remained. How much had he left in the bank?

Assignment 22A

1. A young man's salary is $1500 a year, and he pays $600 a year for board. What per cent of his salary does he pay for board?

2. A dealer bought 1200 bu. of potatoes. He sold 780 bu. What per cent of the potatoes did he still have on hand?

3. A man paid $1500 for an automobile. He kept it a year and sold it for $900. What per cent of the cost was the depreciation the first year?

4. A dealer sold oranges for 5¢ each, for which he paid 40¢ a dozen. What per cent of the cost did he gain on each dozen?

5. A commission merchant sold 30 crates of eggs, of 30 doz. each, for 40¢ a dozen and sent the owner $342. What per cent of the selling price did he charge for selling the eggs?

6. The registration of a school was 1630 pupils. Of this number 241 were absent one day. What per cent were present?

7. A man's assets amount to $28,800 and his liabilities are $5760. What per cent of his assets are his liabilities?

8. An agent received $480 for selling a house and lot for $9600. (a) What per cent was his commission? (b) How much did the owner receive?

Assignment 22B

1. O. D. Moore bought a house and lot for $18,000, and sold it for $15,750. What per cent of the cost did he lose?

2. School was in session 92 days one term and 87 days the next term. One pupil was absent 22 days during the school year. What was his per cent of attendance?

3. An agent sold a building lot for $13,500. He charged $810 for selling the lot. What per cent of the selling price did the owner receive, after the charges for selling were deducted?

4. A man earned $3460 in a year. He paid $540 for rent, $715 for food and clothes, and $422.50 for other expenses. What per cent of his earnings did he save?

5. Three men formed a partnership. One invested $12,000; another invested $15,000, and the third invested $18,000. What per cent of the capital did each man invest?

6. A salesman worked on a commission of 6% of gross sales. During the first month his commission was $186, the second month it was $216, and the third month it was $234. What were his gross sales for the three months?

7. A dealer sold a quantity of vegetables for $28.60. His gain was 30% of the cost. How much did he pay for the vegetables?

8. A merchant sold 1800 lb. of coffee for 28¢ a pound, which was 25% less than he paid for it. (a) How much did the coffee cost him? (b) How much did he lose?

Assignment 23A

1. An easy chair was sold for $72, which was 10% less than the marked price. What was the marked price?

2. A builder erected a house at a cost to him of $18,000. This amount was 20% less than his contract price to build the house. How much did he make over and above his contract?

3. A man received a salary of $2400 a year, which was 20% more than he received the year before. (a) How much was his salary the year before? (b) How much was it increased?

4. How much did a dealer lose by selling an automobile for $1020, at a loss of 15%?

5. A certain corporation pays a dividend of 5%. How many shares of stock, at $100 per share, must be bought to produce a dividend of $1250?

6. If the cost of purchasing amounts to 5% of the price of an article, how many articles at $6.00 each can be bought for $1323?

7. If there are 2 pounds of steel in a certain tool, and 4% is lost in the process of making, how many pounds will be required to make 600 tools?

8. A farmer raised 720 bu. of wheat during one year. This quantity was less by 20% than the quantity he raised the year following. How much did he raise during the second year?

Assignment 23B

1. A dealer sold some shopworn goods at a loss of $12\frac{1}{2}\%$, and as a result lost \$87.50. (a) How much did the goods cost him? (b) For how much did he sell them?

2. A man bought an office building, from which he received \$48,600 rent per year. After paying \$19,400 expenses for the year, he made 8% on his investment. How much did he pay for the building?

3. An agent sold 42,500 lb. of cotton for 22¢ a pound. He received \$233.75 for his services. What rate per cent of the selling price did he charge?

4. *A*, *B*, and *C* are partners in a business. *A* invested \$10,000; *B* invested \$14,000, and *C* invested \$16,000. What per cent of the capital did each partner invest?

5. An agent who received 3% of gross sales earned \$213.60 the first month, \$222.30 the second month, and \$207.45 the third month. (a) How much were his sales for each month? (b) How much were his total sales?

6. A merchant sold an article for \$17.60, at a loss of 12%. (a) How much did the article cost him? (b) How much did he lose?

7. A merchant sold 1500 yd. of silk for \$1800, which was 20% less than he paid for it. (a) How much did the silk cost him a yard? (b) If he had sold the silk for \$1.80 a yard, what per cent would he have gained?

8. A merchant's sales were \$42,600 during the first year; they increased during the second year $27\frac{1}{2}\%$, and in the third year they were \$60,832.80. (a) What were his sales during the second year? (b) What was the percentage of increase of his sales in the third year over those in the second year?

Assignment 24A

1. A man gave a check for \$248. This amount was 16% of the amount he had in the bank. How much had he left in the bank?

2. A farmer produced 280 bu. of potatoes in one field. This was 56% of his whole potato crop. How many bushels did he produce?

3. A salesman traveled 486 miles, or 24% of his route. How many miles more has he to travel?

4. In an apple orchard there were 88 Baldwin trees. These were 11% of the whole number of trees in the orchard. How many trees, other than Baldwin, were in the orchard?

5. A boy drew 28% of his money from the bank and purchased a bicycle for \$56. How much money had he left in the bank?

6. In 25 days a road builder completed $2\frac{1}{4}$ miles of road. This was $12\frac{1}{2}\%$ of the number of miles he contracted to build. (a) How many miles did he contract to build? (b) At this rate, how long will it take him to complete the job?

7. A city with a population of 47,520 had increased 28% in 10 years. What was the population 10 years ago?

8. A dealer sold an automobile at a profit of 18%. If his profit was $270, for how much did he sell the car?

Assignment 24B

1. A salesman sold $560 worth of goods the first week, $677.60 worth the second week, and $833.45 the third week. What was the percentage of increase of his sales (a) the second week over the first? (b) The third week over the second?

2. A man invested $28,000 in real estate. He sold his real estate at a profit of 12½%, which he added to his capital. He invested the proceeds of the sale of his real estate in stock, and lost 17%. (a) For how much did he sell his stock? (b) What per cent of his original capital was his net loss?

3. A merchant during the first year made a profit of 12%; the second year, a profit of 16%; and the third year, a profit of 22%. The first year his profit was $2760; the second year it was $3840, and the third year it was $5720. What were his gross sales for the three years?

4. A manufacturer bought 100,000 lb. of cotton at 17¢ a pound. He paid $312.34 freight, $56 cartage, and $340 commission. (a) What was the gross cost of the cotton? (b) What per cent of the gross cost were the charges?

5. A dealer bought 800 bbl. of apples for $4.50 a barrel. He kept them in storage for 4 months, for which he paid 50¢ a barrel. He sold the apples for $6.50 a barrel. What per cent of profit did he make on the gross cost?

6. A speculator bought a house and lot for $15,000. During the time he owned it he paid out for interest, taxes, repairs, insurance, and other charges, $2500. He sold it for $21,000 through an agent, who charged 5% for making the sale. What was (a) the net profit? (b) The per cent of profit on the gross cost?

7. A man who earned $4000 a year saved 25% of what he earned. Each year he loaned his savings on bond and mortgage at 6% annually. What would his income be in the fourth year?

8. A radio dealer sold 10% more radios in the second year than he did in the first year; 25% more in the third year than the second, and 20% more in the fourth year than the third. During the four years he sold 1025 radios. How many did he sell the first year?

BILLING AND TRADE DISCOUNT

Assignment 25A

1. Find the net cost of the following:

5 pc. Serge 44^2, 46^1, 47^3, 48^2, 43^1	@	$4.80
4 pc. Cheviot 38^3, 37^2, 39^1, 36^3	@	5.20
5 pc. Broadcloth 41^1, 43^2, 42^2, 44^1, 45^3	@	7.25

Less 10%

2. Find the net cost of the following:

4 pc. Satin Charmeuse 38^1, 37^2, 36^3, 39^1	@	$1.85
5 pc. Canton Crepe 46^1, 47^2, 44^3, 45^1, 46^2	@	1.45
5 pc. Chiffon 38^1, 37^2, 35^1, 34^3, 39^2	@	1.95

Less 8%

3. Find the net cost of the following items:

$2\frac{1}{6}$ doz. Coal Hods #H99	@	$7.20
$1\frac{1}{4}$ doz. Steel Oil Cans #S34	@	9.60
$2\frac{3}{4}$ doz. Galv. Water Pails #G62	@	4.20
$3\frac{1}{3}$ doz. Scoop Shovels #SC12	@	6.60

Less 12%

4. Prepare in correct form the following invoice: E. W. Haver, Denver, Col., bought from L. H. Dwyer & Co., Chicago, Ill.:

30 doz. pkg. Up. Nails #K98	@	$1.12
25 doz. pkg. Num. Nails #N24	@	2.45
12 doz. pkg. Hooks and Eyes #2–8	@	1.65
8 doz. pkg. Screw Eyes assorted	@	1.85

Less 15%

5. Find the net cost of the following items:

$2\frac{1}{2}$ doz. Locks #T. R. 19	@	$ 7.80
$3\frac{1}{6}$ doz. Night Latches #N. L. 64	@	17.70
$4\frac{1}{4}$ doz. Rim Latch Sets #R. L. S. 28	@	18.60
$1\frac{3}{4}$ doz. Fulton Locks #F28	@	15.90

Less $16\frac{2}{3}$%

6. Find the net cost of the following items:

18 Shovels #S.S. 212	@	$1.12
15 Shovels #C.S. 214	@	1.15
27 Spades #S.P. 42	@	.78
30 Garden Forks #G.S. 28	@	.86

Less $12\frac{1}{2}$%

Assignment 25B

1. Find the net cost of the following:

$2\frac{1}{2}$ doz. Locks No. T. R. 19	@	$6.65
$1\frac{3}{4}$ doz. Night Latches No. N. L. 64	@	15.80
$2\frac{1}{4}$ doz. Latch Sets No. R. L. S. 27	@	18.75
$\frac{5}{6}$ doz. Fulton Locks No. F. 28	@	15.00

Less 15% and 3%

2. Prepare in correct form the following invoice: Bought from the Howard Hardware Company, Buffalo, N.Y.:

$3\frac{1}{4}$ doz. Strap Hinges No. S. H. 92	@	$8.28
18 doz. Carriage Bolts No. C. B. 1337	@	5.65
9 doz. pkg. $\frac{1}{4}$ Rivets No. W. B. 30	@	1.45
15 doz. pkg. Steel Rivets No. F. S. 17	@	1.56

Less 8% and 5%

3. Find the net cost of the following:

6 pc. Satin Crepe 58^2, 59^1, 56^3, 57^2, 54^1, 55^3	@	$2.65
5 pc. Canton Crepe 48^1, 45^2, 44^1, 48^3, 47^2	@	1.88
6 pc. Silk Pongee 48^1, 47^2, 49^1, 44^3, 46^2, 45^1	@	.92
4 pc. Taffeta 55^2, 54^1, 57^3, 58^2	@	2.24

Less 8% and 2%

4. Prepare in correct form the following invoice: D. E. North Detroit, Mich., bought of A. H. Atkins & Co., of Chicago, Ill. (use current date):

$3\frac{1}{2}$ doz. F. S. Hammers No. 57	@	$18.60
$2\frac{1}{3}$ doz. Steel Cutters No. H. C. 72	@	21.40
$1\frac{3}{4}$ doz. Forged Tongs No. F. D. 63	@	5.88
$2\frac{1}{6}$ doz. Cutting Nippers No. C. S. 24	@	8.40

Less 12% and 5%

5. Find the net cost of the following:

7 Vises No. R. A. 214	@	$3.85
18 Vises No. H. C. 312	@	2.95
6 Vises No. W. D. 171	@	1.80
14 Vises No. C. B. 68	@	3.45

Less 8% and 4%

6. One firm offered goods costing $2480, less a discount of 8% and 6%. Another firm offered the goods at the same list price, less a discount of 12% and 2%. Which offer is the better, and how much better?

Assignment 26A

1. Find the cost of 7 loads of coal weighing, respectively, 3800 lb., 4320 lb., 4560 lb., 3970 lb., 4290 lb., 4340 lb., and 5210 lb., at $15.40 per ton of 2000 pounds.

2. Find the selling price of 6 loads of wheat weighing, respectively, 3760 lb., 3590 lb., 3180 lb., 3270 lb., 3820 lb., 3310 lb., at $1.66 per bushel of 60 pounds.

3. Find the selling price of 5 loads of oats weighing, respectively, 2110 lb., 1980 lb., 2260 lb., 2340 lb., and 2180 lb., at 57¢ per bushel of 32 pounds.

4. Prepare in correct form, the following invoice: E. A. Allen, Albany, sold to O. H. Wilson, on account (use current date):

6 lb. Coffee	@	28¢
25 lb. Sugar	@	6½¢
2 bu. Potatoes	@	$1.20
2 lb. Tea	@	48¢
Total		

5. Find the total of the following bill:

28 yd. Calico	@	14¢
35 yd. Gingham	@	54¢
29 yd. Flannel	@	67¢
38 yd. Cambric	@	11¢
36 yd. Cheese Cloth	@	7¢
Total		

6. Find the cost of each of the following and the total:

370 yd. Brussels Carpet	@	$2.80, less 8%
460 yd. Ingrain Carpet	@	1.15, less 12%
270 yd. Velvet Carpet	@	3.20, less 6%
190 yd. Wilton Carpet	@	4.35, less 10%
Total		

Assignment 26B

1. Sold to O. D. Harper, Hartford, Conn., terms 6/10, n/30:

12 doz. Dinner Plates P. G. 21	@	$14.50
4¾ doz. Bread and Butter plates B. B. 24	@	9.96
3⅓ doz. Tea Saucers T. S. 60	@	5.85
3⅓ doz. Teacups H. T. 70	@	7.80

Find the net amount, if paid in 10 days.

2. Sold to H. G. Graves & Co., Boston, Mass., terms 4/10, n/30:

112 pc. Cypress 1″ × 8″ × 16′	@	$76.50
165 pc. Cypress 1″ × 6″ × 14′	@	72.50
235 pc. Cypress 1″ × 12″ × 12′	@	77.00
140 pc. Cypress 1″ × 4″ × 16′	@	85.00

Find the net amount, if paid in 10 days.

3. Sold to Minnesota Grain Co., Minneapolis, Minn.:

5 cars No. 1 Wheat 200,160 lb	@	$1.68 per bu.
3 cars No. 2 Wheat 121,080 lb	@	1.47 per bu.
4 cars No. 1 Oats 96,320 lb	@	.64 per bu.
2 cars No. 2 Barley 64,800 lb	@	.92 per bu.

(Wheat 60 lb. per bu., oats 32 lb. per bu., and barley 48 lb. per bu.) Find the amount.

4. Sold to M. A. Hoffman, Omaha, Neb., terms 3/10, n/60., F. O. B. Mine—Long Tons:

184,960 lb. Egg Coal	@	$4.90
148,840 lb. Stove Coal	@	5.20
96,980 lb. Chestnut Coal	@	5.10

Find the net amount, if paid in 10 days.

5. Sold to A. S. Crane, Duluth, Minn., terms 2/30, n/60:

$3\frac{2}{3}$ doz. Padlocks G. C. No. 27	@	$3.70
$2\frac{1}{3}$ doz. Padlocks G. S. No. 34	@	2.28
$2\frac{1}{4}$ doz. Pulleys F. P. No. 290	@	5.75
12 kegs Nails No. 8	@	4.95

Find the net amount, if paid in 30 days.

6. Sold to the Harper Furniture Co., Atlanta, Ga., terms 8/10, n/90:

18 Bed Springs M. T. 42	@	$11.45
26 Mattresses C. F. 67	@	18.80
36 Pillows G. F. #2H	@	2.15
15 Mattress Covers #37	@	2.75

Find the net amount, if bill is paid in 10 days.

Assignment 27A

1. A merchant bought an invoice of goods amounting to $1248.60, less $12\frac{1}{2}\%$ and 3%. What was the net cost?

2. Gas fixtures were bought at a discount of 35% and 10%, and sold at a discount of 10% and 5%. How much was made on each dollar's worth handled?

3. Bathtubs were bought at $65 each, less 40% and 4%, and sold at the same list price, less 8%. How much was made on the sale of 20 tubs?

4. The discount on an invoice of hardware was \$142.80. If the rate of discount was 6%, how much was the gross amount of the invoice?

5. Overcoats which were marked to sell for \$67.50 were marked down to \$45. The difference in price is equal to what per cent discount on the original price?

6. A dealer bought lamps for \$12.50 each, less 20% and 10%, and sold them at \$15 each. What per cent of the net cost was his profit?

7. A merchant bought a quantity of dry goods, which he sold at a discount of $12\frac{1}{2}$%. The discount amounted to \$2889.60. Find the price at which he sold them.

8. A piano was purchased for \$380, which was 20% and 5% less than the marked price. What was the marked price?

Assignment 27B

1. A dealer bought an invoice of plumbing supplies amounting to \$1284.60, less 30%, 8%, and 3% discount. What was the net cost?

2. The wholesale price of tables is \$22.50 each. If you bought them at this price, less $33\frac{1}{3}$% and 5%, and sold them at \$25, less 5%, how much would you make on 18 tables?

3. A dealer bought a quantity of gas fixtures at 35% and 15% less than list price, and sold them at the same price, less 8% and 2%. The quantity purchased was listed at \$3850. Find the dealer's net gain.

4. The discount on an invoice of millinery was \$516.60, and the rates of discount were 20% and $12\frac{1}{2}$%. What was the net amount of the invoice?

5. A furniture dealer marked prices down as follows: chairs marked \$8, now \$6.40; stands marked \$12, now \$9; and rockers marked \$18, now \$12.60. What was the rate of discount in each case?

6. A dealer bought 30 porch hammocks for \$1050, less 20% and 5%. The freight was \$12. Find (a) the gain and (b) the selling price of each hammock, if they were sold at 40% more than the gross cost.

7. An invoice of goods cost \$2445.60, less $33\frac{1}{3}$% and 8%. The freight and cartage were \$21.33. Find (a) the gain and (b) the selling price, if the goods were sold at an advance of $33\frac{1}{3}$% of the gross cost.

8. A merchant bought dresses for \$27.50 each, less 20% and 10%, and sold them for \$45, less 20% and 5%. How much did he make on 2 dozen dresses?

PROFIT AND LOSS

Assignment 28A

1. A piano costing \$320 was sold at a profit of 25%. What was the selling price?

2. A dealer sold a cargo of coal, which cost him \$12,900, at a profit of $16\frac{2}{3}$%. How much did he gain on the cargo?

3. A man who did a business of $28,700 the first year, increased his business 22% the second year, and again increased it 25% the third year over the second. What was the amount of his business in the third year?

4. How much did a dealer lose by selling an article for $1312.50, at a loss of $12\frac{1}{2}\%$?

5. A man bought a house and lot for $14,800. He paid $1080 for repairs and taxes, and sold the property for $16,674 net after the expenses of the sale were paid. What per cent of profit on the gross cost did he make?

6. A merchant bought 3 pieces of cloth, containing 55 yards each, for $115.50. He sold them at retail for 95¢ a yard. Find (a) his total gain and (b) his rate per cent of gain on the cost.

7. A dealer wishes to specialize in shoes that he can sell for $6 a pair, at a profit of 50%. How much can he pay for each pair of shoes?

8. An article was sold for $4.80, at a loss of 4%. For what price should it have been sold in order to gain 25%?

Assignment 28B

1. A dealer bought couches for $64 each, less 15%. He paid $1.80 freight on each couch. For how much must he sell each couch to make a profit of 25% on the gross cost?

2. A dealer bought chairs for $8.40, less $12\frac{1}{2}\%$ and 2%. At what price must he sell each chair to make a profit of $33\frac{1}{3}\%$ on the net cost?

3. A manufacturer sold an article to a jobber for $60, less 25% discount; the jobber sold it to the retailer for $75, less 20% discount; and the retailer sold it to the consumer for $90, less 10% discount. What per cent of profit did (a) the jobber make? (b) The retailer?

4. A dealer offered an article for sale for $160, at a profit of $33\frac{1}{3}\%$. He finally accepted 10% less than the asking price. What was his rate per cent of profit?

5. A merchant paid $344.25 for an article, after discounts of 15% and 10% had been deducted. (a) How much did he receive for the article by selling it at a profit of 10% on the original list price? (b) What was his profit on the net cost?

6. A dealer paid $20 for a chair, less discounts of 20% and 20%. He paid 70 cents freight and sold the chair for $33\frac{1}{3}\%$ profit on the gross cost. For how much did he sell it?

7. A dealer paid $200 per dozen for electric fans, less 20% and 10% discount. He paid $6 per dozen express and sold them at $20 each. What per cent of profit did he make on the gross cost?

8. A dealer paid $280 for 10 tables, less 25% and 10%. The total freight was $11, and he sold them at a profit of 25% on the gross cost. How much did he make on each table?

Assignment 29A

1. A man sold stocks for \$12,000, at a profit of 25% on what he paid for them. How much did he gain?

2. A man bought an automobile for \$900. The dealer who sold the car lost 25% by selling it at that price. How much did it cost the dealer?

3. A merchant sold goods at 10% below the marked price and made a profit of 25% on the cost. How much did he make on an article marked \$4.50?

4. A dealer sold an article which cost \$7.20 at a profit of 25%, after allowing a discount of 10% on the marked price. What was the marked price?

5. An article was sold for \$4.50, at a loss of 10%. At what price should it have been sold in order to have made a profit of 25%?

6. An agent made \$195 by selling an automobile at a profit of 15%. How much did the automobile cost the agent?

7. A dealer bought 3000 bricks for \$27. For how much per M. must he sell them to gain 25%?

8. What is the per cent of gain on goods marked 40% above cost and sold at 20% discount on the marked price?

Assignment 29B

1. A wholesale merchant sold suits to a dealer for \$40, less 25%. At what price should the dealer mark them to sell at a discount of $12\frac{1}{2}\%$ and still make a profit of 40%?

2. A manufacturer sold 40 dozen chairs to a dealer at \$48 per dozen, less $12\frac{1}{2}\%$. The dealer paid \$24 freight, and marked the chairs to sell at \$6 each. What per cent of profit did the dealer make, if he allowed 10% discount?

3. A merchant bought a day-bed for \$96, less a discount of 10%. At what selling price must he mark it so that he may allow a discount of 20% from his asking price and still make a profit of 50%?

4. A merchant sold a tea wagon marked \$64 at a discount of $12\frac{1}{2}\%$, thereby making a profit of 60%. (a) How much did he pay for the tea wagon? (b) What was the list price, if the discount allowed the customer was 30%.

5. A manufacturer sold an article to a wholesaler at 20% profit; the wholesaler sold it to a retailer at 25% profit; and the retailer sold it to the consumer for \$18, at 50% profit. How much did the article cost the manufacturer to produce?

6. The cost of manufacturing a radio receiving set is as follows: material, \$28.80; labor, \$34.60, overhead, \$2.40. At what price must it be sold to make a profit of 50% and allow 25% for advertising?

7. At what selling price must linoleum costing \$2.80 per square yard be marked in order to gain 50% and allow discounts of 20% and 12½%?

8. Goods listed at \$2 and bought at a discount of 40% must be marked at what price to gain 33⅓% and allow a discount of 20%?

Assignment 30A

1. A piano lamp was purchased for \$37.50, less 20% discount. For how much must it be sold to make a profit of 25% on the selling price?

2. A merchant bought an article for \$64.25, less 10% and 5% discount. For how much must he sell it to gain 33⅓% on the selling price?

3. Merchandise invoiced at \$911.40 gross cost will have to be sold for how much to allow 16⅔% of sales for cost of doing business, and make a net profit of 10% on the gross cost?

4. The gross cost of an article is \$13.02. For how much must it be sold to allow 17½% of the selling price for the cost of selling, and make a net profit of 12½% on the selling price?

5. The invoice price of an article was \$37.50. The cost of buying was 4% of the invoice price. The profit on the gross cost was 12½%. The cost of selling was 20% of the sales. Find the selling price of the article.

6. A merchant bought a gas heater for \$16, less 20% discount. He sold it for \$19.20. What per cent of the selling price did he make if the cost of doing business was 22% of the selling price?

7. A day bed was bought for \$80, less 20%, and sold for \$120, less 10%. If the cost of doing business was 33⅓% of the sales, what was the per cent of profit on the net cost?

8. The net cost of a couch was \$54.50. The buying expenses were 4% of the net cost. If the couch was sold at a profit of \$14.17, what was the per cent of profit on the net cost?

Assignment 30B

1. A dealer bought a pair of skates for \$9.75, less 33⅓% discount. For how much must he sell them, to make a profit of 35% on the selling price?

2. A merchant's sales for the year amounted to \$128,400. The cost of doing business was \$28,248. An article that cost \$16.50 gross will have to sell at what price to cover the cost of doing business and allow for a net profit of 11⅓% of the selling price?

3. The invoice price of an article was \$30, less 12½% and 4%. The buying expenses were 5% of the invoice price. What must be the selling price to make a profit of 20% on the gross cost, and allow 20% of the selling price to cover the cost of doing business?

4. A dealer bought an article for \$48.80, less $12\frac{1}{2}\%$ discount. He sold it for \$75, less 10% discount. What per cent on the net selling price did he make, if the cost of doing business was 24.24% of the sales?

5. Leather coats cost \$18, less $12\frac{1}{2}\%$. If they are sold for \$25 each, less 10%, and the cost of doing business is 20% of the sales, what is the per cent of profit on the gross cost?

6. A merchant bought andirons for \$20 a set, less $12\frac{1}{2}\%$ and 2% discount. He sold them for \$30, less 20%. If his buying expenses were 85¢ a set and his selling expenses were $16\frac{2}{3}\%$ of the net sales, what per cent of the gross cost was his net profit?

7. The profit from the sale of a suit of clothes was \$21. If the profit was 40% of the gross cost and the cost of buying was 5% of the net cost what was (a) the gross cost? (b) The net cost? (c) The selling price? (d) The cost of buying?

8. The net cost of an easy chair was \$45. The freight and cartage were 4% of the net cost. The chair was sold at a profit of \$15.60. (a) What was the per cent of profit on the gross cost? (b) What was the selling price?

COMMISSION

Assignment 31A

1. A dealer shipped to a commission merchant 30 crates of eggs of 30 doz. each. The merchant paid \$18 freight and sold the eggs for 52 cents a dozen. After deducting his commission of 5%, how much should he remit to the dealer?

2. An agent received a consignment of 8460 bu. of potatoes. He paid \$1260 freight and \$142 for handling, carting, and other charges. If he sold the potatoes for \$1.60 a bushel and charged 3% commission, how much should he remit to the owner?

3. An agent was instructed to buy 4000 lb. of coffee. He paid 23 cents a pound for the coffee and paid charges for carting and other services amounting to \$13.60. If he charged 4% for buying, what is the amount of the bill he should send the principal?

4. An agent bought \$5812 worth of dry goods on $3\frac{1}{2}\%$ commission. He charged $\frac{1}{2}\%$ for guaranty and \$8.50 for expenses. Find the gross cost.

5. An agent sold 15,900 bu. of wheat for \$1.66 a bushel, on a commission of 2%. He paid freight and other charges amounting to \$2334.12. (a) How much should he remit to his principal? (b) How much per bushel did the principal realize?

6. My agent, who collected a bill for me, remitted \$1642.50, after deducting his commission of 10%. How much the billwas?

7. The principal received $3871.80 as the net proceeds of a consignment of wheat which was sold for $1.60 a bushel. If the agent charged 2 cents a bushel for selling, and paid freight amounting to $324, how many bushels were there in the consignment?

8. An agent sold 3800 bu. of corn. After paying $190 charges and deducting his commission of $2\frac{1}{2}\%$, he sent his principal $2625.80. For how much per bushel did he sell the corn?

Assignment 31B

1. An agent sold 2640 bu. of wheat at $1.86 per bushel, on a commission of 2%. The other charges were: for freight $396.50, and for storage, $66.00. Find the net proceeds.

2. D. W. Hand & Co., New York, sold for the account of A. E. Moore, Lewiston, Maine, a consignment of potatoes:

The amounts and selling prices were as follows:

October 15, 3480 bu	@	$1.75	per bushel
" 21, 2760 bu	@	1.71	" "
" 30, 5470 bu	@	1.80	" "

The charges were: for freight, $1240; for handling, $112; commission, $2\frac{1}{2}\%$. Prepare in correct form an account sales dated November 2, current year.

3. An agent remitted to his principal $5992, after retaining his commission of 3% and paying other charges amounting to $410. How many barrels of sweet potatoes did he sell, at $6 a barrel?

4. An agent sold 480 crates of oranges. After deducting his commission of 5% and paying other charges amounting to $148.60, he remitted to his principal $2815.40. For how much per crate were the oranges sold?

5. D. E. Cooper sent his agent $1750 and directed him to buy Y. H. tea. The agent charged 3% commission for buying the tea and paid $25.78 for freight. How many pounds of tea did he buy at 36¢ a pound?

6. C. E. Blake & Co. received from L. E. Brown $1700 in settlement of an account purchase. Blake & Co. paid $6.50 a barrel for the flour. The charges were as follows: commission for buying, 2%; cartage, $40, and inspection, $2.50. How many barrels of flour did the agent buy?

7. An agent purchased for his principal 225 bbl. of sugar, each weighing 280 lb., at a net price of $4\frac{1}{2}$¢ a pound. He charged 4% commission and $39.20 for cartage. (a) How much did the sugar cost? (b) If it is sold at $6\frac{1}{2}$¢ a pound, find the net profit.

8. An agent charged $210.60 for buying oil on a commission of 3%. (a) How many barrels of oil did he buy at $2 a barrel? (b) What was the gross cost of the oil, if the other charges amounted to $71.35?

TRADE DISCOUNT AND COMMISSION

Assignment 32A

1. A dealer bought an article for \$2, at a discount of 20% and 10%. At what price must he mark it for sale, to make a profit of 50% on the cost after allowing a discount of 20%?

2. A merchant sold a set of dishes for \$100, at a loss of 20%. What per cent of profit on the cost would he have made if he had sold them for \$175?

3. An agent's commission at 3% amounted to \$207. What was the amount of (a) the sales, (b) the net proceeds, if other charges amounted to \$121.40?

4. A commission merchant sold a consignment of butter on a commission of $2\frac{1}{2}$%. How many pounds did he sell at 56¢ a pound, if other charges were \$28.90 and he remitted to his principal \$1303.34?

5. A buyer received discounts of 30% and 5%. If the discounts amounted to \$837.50, what was the net cost of the goods?

6. An agent sold 4000 bu. of potatoes for his principal. After deducting his commission of 3% and \$286.40 for freight and cartage, he remitted \$6309.60 as the net proceeds. For how much a bushel did he sell the potatoes?

Assignment 32B

1. An agent's commission at $2\frac{1}{2}$% for buying 400 crates of oranges was \$65. The charges for handling amounted to \$31. How much per crate did the oranges cost the principal?

2. An agent expended \$10,080 in buying wool. This amount included the following charges: commission, \$288; traveling expenses, \$122, and storage, \$70. (a) How many pounds did he buy at 80¢ a pound? (b) What rate per cent of commission did the agent charge?

3. One jobber offered a piano at \$480, less 25% and 10%; another jobber offered the same make of piano for \$500, less 30% and 6%. Which is the better offer, and how much better?

4. G. E. Gray of Rochester, N. Y., sent A. H. Martin & Co., New York City, 5 carloads of apples, consisting in all of 560 bbl., to be sold on commission. On November 7, 280 bbl. were sold at \$5.20 a barrel; on November 10, 200 bbl. were sold for \$5.25 a barrel; and on November 12, the remainder was sold for \$5.15 a barrel. The freight was 44¢ a barrel and the commission 4%. Prepare an account sales.

5. At what price must skates, invoiced at \$10 a pair, less 20% and 15%, be marked so as to allow a discount of 15% on the marked price and still make a profit of 50%?

6. One jobber will sell hats delivered, for \$48 a dozen, less 15% and 10%. Another jobber will sell the same kind of hats for \$56 a dozen, less 20% and 20%. Which is the better offer, and how much better?

SIMPLE INTEREST

Assignment 33A

1. Find the interest at 6% on \$1285 for 2 yr., 3 mo., 16 days.

2. Find the interest at 6% on \$18,800 for 3 yr., 9 mo., 27 days.

3. Find the interest at 3% on \$27,950 for 1 yr., 1 mo., 12 days.

4. Find the interest at $4\frac{1}{2}$% on \$16,720 for 4 yr., 4 mo., 22 days.

5. Find the interest at 9% on \$3395 for 8 mo., 11 days.

6. Find the interest at 5% on \$15,400 for 1 yr., 9 mo., 18 days.

7. Find the interest at $5\frac{1}{2}$% on \$7284 for 11 mo., 14 days.

8. Find the interest at 7% on \$12,260 for 1 yr., 10 mo., 29 days.

Assignment 33B

(Note. In the following problems, count the exact number of days.)

1. Find the interest at 6% on \$3428 from June 4 to December 16, current year.

2. Find the interest at 5% on \$2872.60 from January 10 to July 27, current year.

3. Find the interest at $4\frac{1}{2}$% on \$5688.50 from February 12 to September 17, current year.

4. Find the amount of \$11,425 on interest at 7% from July 9 to November 28, current year.

5. Find the amount of \$8668.70 on interest at $5\frac{1}{2}$% from January 16 to December 9, current year.

6. A merchant bought goods amounting to \$4860 on the following terms: net at four months' credit or 6% discount for cash. How much would he gain by borrowing the money, at 6%, for four months and paying cash for the goods?

7. A depositor's balance in a savings bank on July 1 was \$460. If interest at 4% per annum is credited to his account on January 1 and on July 1 in each year, how much is his balance at the end of the third year?

8. Referring to Problem **7**, how much interest was credited to the depositor's account during the three years?

ACCURATE INTEREST AND BANK DISCOUNT

Assignment 34A

(Note. In the following problems, use the current year.)

1. Find the exact interest on \$560 from July 5 to December 10, at 6%.

2. Find the exact interest on \$1270 from January 6 to August 18, at 5%.

3. Find the exact interest on \$2750 from March 14 to September 10, at 4%.

4. Find the difference between the ordinary and the exact interest on \$1500 for 6 months after April 1, at 6%.

5. A man gave a demand note for \$780 on January 4, with interest at 6%. He paid the note in full September 11. How much did he pay?

6. A note for \$2850 was given May 2, for 6 months, with interest at 5%. The note was paid when due. Find the amount.

7. A 3-months' note for \$1000, dated July 7, was discounted at the Commercial Bank for 3 months at 6%. Find the proceeds.

8. On March 12, a dealer sold an automobile for \$1500, taking in payment \$600 cash and a 6-months' note for \$900. He discounted the note at 6% at his bank on the day he received it. (a) Find the proceeds of the note. (b) What was the cash price of the automobile?

BANK DISCOUNT

Assignment 34B

(Note. In the following problems, use the current year.)

1. A note for \$1250, dated June 5, payable 6 mo. after date, was discounted at a bank 1 mo. after June 5, at 6%. Find the proceeds.

2. Find the proceeds of a note for \$1800 payable 4 mo. after March 16, and discounted at a bank April 11, at 6%.

3. Find the bank discount on a note for \$480, dated April 10, and payable in 4 mo., if discounted at a bank June 1, at 6%.

4. Jackson received from Maxwell a note for \$1450, dated January 10, for 9 months. Jackson discounted this note on February 16, at the First National Bank, at 6%. Find the proceeds.

5. O. E. Moore of Denver, Colorado, made a note, payable to himself, for \$8000, dated May 8, and payable 4 months after date, at the Merchants Bank of Denver. C. D. Lance endorsed this note, and Moore had it discounted at 6% on the date of issue, at the Merchants Bank. Find the proceeds.

6. A merchant bought an invoice of goods for $1664.80 on the following terms: net at 4 months' credit or 8% discount for cash. He discounted his note at 6%, and paid cash. The note was dated August 6, and made for such an amount that, when it was discounted, the proceeds were equal to the net amount of the invoice. (a) Find the face of the note. (b) How much did he gain?

7. E. E. Pierce purchased from W. H. King of Boston an invoice of goods amounting to $4620, less 10% and 5% discount. Pierce accepted a draft for 4 mo. dated May 14, payable at the Mechanics Bank of Boston. King had this draft discounted at 6% on May 21. Find the proceeds.

8. A 90-day note for $3765, dated February 12, was discounted at a bank on April 2, at 6%. Find the proceeds.

TRUE DISCOUNT

Assignment 35A

1. Find the present worth and true discount of a note for $1236 due in 6 months, if money is worth 6%.

2. A man was offered a used automobile for $900 cash, or $1000 due in 1 yr. If money was worth 6%, which was the better offer, and how much better?

3. What cash offer is equivalent to an offer of $3000 on 6 months credit, if money is worth 6%?

4. A merchant sold $1560 worth of goods on 4 months' credit. What would be the equivalent cash price, if money is worth 6%?

5. Which is the better offer, and how much: to buy an article at $9 a dozen on 4 months' credit, or to borrow the money and pay $8.50 a dozen cash, money being worth 6%?

6. A man owes $4500, due in 6 mo., without interest. What are the present worth and true discount, if money is worth 6%?

7. If money is worth 6%, what cash offer will be equivalent to an offer of $1800 for an automobile on 9 months' credit?

8. Find the difference between the simple interest and the true discount on $3800 for 1 yr. at 6%.

Assignment 35B

1. Find the difference between the true discount and the simple interest on $2750 for 8 mo. at 6%.

2. When money is worth 6% interest, what cash offer is equivalent to an offer of $2960 on 4 months' credit?

3. Which is the better bargain, and how much better: to buy \$1200 worth of goods on 6 months' credit, or to borrow the money and get a discount of 5% for cash, if money is worth 6%?

4. An agent took an automobile in exchange at \$750. He kept it for 1 year and sold it for \$850, on 9 months' credit. If money was worth 6%, what was his actual gain?

5. A speculator bought a house and lot for \$12,500. He kept it 12 mo. and sold it for \$16,000 on 8 months' credit. If he paid \$800 for repairs, and money was worth 6%, what was his net gain?

6. A dealer bought a cash register for \$350 cash, and sold it after holding it for 1 yr., taking in payment a 9-months' note for \$400. He endorsed the note over to the cash register company at its present worth on the day he received it. What was his net gain, if money was worth 6%?

7. What is the difference between the true discount and the bank discount at 6% on a note for \$1800, due in 72 days?

8. Find the present worth and the true discount of a note for \$2600, with interest at 5% and due in 6 mo., if money is worth 6%?

INTEREST AND DISCOUNT

Assignment 36A

1. Find the proceeds of a 4-months' note for \$1100, dated April 1 and discounted April 16 at 6%.

2. Find the difference between the simple interest and the true discount on \$2440 for 3 mo. at 6%.

3. What is the difference between the accurate interest and the ordinary interest on \$16,600 for 198 days at 6%?

4. How much must be paid for property to produce a net annual income of \$2880, if money is worth 6%?

5. The interest on a 4-months' note, at 6%, was \$37.80. What was the face of the note?

6. For what sum must a merchant, who wishes to borrow \$1800 on April 22, give his 4-months' note so that, when it is discounted at 6%, the proceeds will equal the amount he wishes to borrow?

7. At what rate of interest will \$720 earn \$18 interest in 150 days?

8. In how many days will \$1620 earn \$34.56 interest at 6%?

Assignment 36B

1. A dealer bought an invoice of goods amounting to \$1345 on the following terms: 6/10, n/90. How much would he gain by borrowing the money, at 6%, for 90 days and paying cash for the goods?

2. Find the proceeds of a 4-months' note for \$800, dated March 6, 19—, with interest at 6%, and discounted at a bank 10 days after it was made, at 6%.

3. On March 12, 19—, a merchant purchased goods amounting to \$950, and gave in payment a 3-months' note, bearing interest at 6%. The note was discounted on the date issued, at 6%. Find the proceeds.

4. Find the discount and proceeds of a 6% interest-bearing 6-months' note for \$3400, dated January 16, and discounted March 1, at 6%. (Use the current year.)

5. On May 6, 19—, a merchant is offered \$1800 worth of merchandise on these terms: net at 8 months' credit or 5% discount for cash. Which is the better offer, and how much better, if money is worth 6%?

6. A merchant is offered a discount of 5% or 4 months' credit on a bill of goods amounting to \$1640. He discounted his 4-months' note at a bank, at 6%, for such an amount that the proceeds of the note just paid the net amount of the bill. How much did he gain by this transaction?

7. A 9-months' note dated June 4, bearing 6% interest, was discounted at a bank August 14, at 6%. The proceeds were \$1514.73. What was the face of the note? (Use the current year.)

8. On May 20, 19—, a dealer sold goods for \$2250. He accepted in payment a 90-day note for such an amount that, when it was discounted at a bank at 6%, the proceeds would just pay for the goods. Find the face of the note.

Assignment 37A

1. A note due in 156 days is discounted at 6% on the day it is given. The proceeds are \$759.72. What is the face of the note?

2. A man wishes to borrow \$3000 from a bank. For what amount must he give his 4-months' note if the bank accepts it at 6% discount?

3. A bank placed to the credit of a depositor \$2413.25, after discounting his 90-day note at 6%. Find the face of the note.

4. A man deposited \$300 in a savings bank on July 1 and January 2 for three consecutive years. If the bank adds 4% interest to the principal every 6 months and there were no withdrawals, how much had he in the bank at the end of the time?

5. A man borrowed \$2500 on July 1, and on November 1 he paid the note with interest. The whole sum amounted to \$2550. What rate of interest did he pay? (Use the current year.)

6. The cash price of an article is \$300, and the price on 6 months' credit is \$325. The difference in the prices is equal to what rate of interest on the cash price?

INTEREST PROBLEMS

Assignment 37B

1. A man deposited \$500 in a savings bank on January 2 and July 1 for two consecutive years. If the bank paid $4\frac{1}{2}\%$ interest and added the interest to the principal every 6 months, how much had he in the bank at the end of the time?

2. The cash price of an automobile is \$1500, and the price on one year's credit is \$1650. (a) The difference in the prices is equal to what rate of interest on the cash price? (b) If money is worth 6%, what per cent is allowed for bad debts?

3. Johnson borrowed \$24,000 for 6 months, at 6% interest, and purchased 16,000 bu. of wheat at \$1.50 a bushel. Six months later he sold the wheat at \$1.77 a bushel. (a) How much did he make? (b) What was his per cent of profit on the cost of the wheat?

4. A man borrowed \$7500 on June 12, 1928. On August 12, 1929 he paid the note with interest. The whole sum amounted to \$8025. What rate of interest did he pay?

5. A merchant bought \$4860 worth of merchandise on 90 days' credit. For what amount will he have to give his 6% interest-bearing note so that, when due and paid, it will cancel the debt?

6. Find the discount at 6% on a 6% interest-bearing note for \$4500, dated April 4, 1929, and given for one year, if discounted June 11, 1929.

Assignment 38A

1. A note for \$400 dated March 1, 1928, with interest at 6%, had payments endorsed on it as follows: June 1, 1928, \$100; September 1, 1928, \$200. How much was due March 1, 1929?

2. A note for \$2000, dated May 1, 1928, with interest at 6% had payments endorsed on it as follows: November 1, 1928, \$500; February 1, 1929, \$1000. How much was due May 1, 1929?

3. A note for \$1500, for one year, dated July 1, 1928, with interest at 6%, had payments endorsed on it as follows: \$500, November 1, 1928; and \$500, March 1, 1929. What amount should be paid July 1, 1929?

4. A note dated May 1, 1927, for \$800, for two years with interest at 6%, had the following payments endorsed on it: November 1, 1927, \$200; May 1, 1928, \$200; November 1, 1928, \$200. How much was due May 1, 1929?

5. A note dated January 2, 1927, for \$1200, with interest at 6%, was endorsed for payments as follows: July 2, 1927, \$300; January 2, 1928, \$300; July 2, 1928, \$300. How much was due January 2, 1929?

6. A man agreed to pay a debt of $1600 in four semiannual installments, with interest at 5% per annum. What was the full amount he had to pay, if he paid $\frac{1}{4}$ each time and the interest then due?

Assignment 38B

1. A note for $2500, for 15 months from January 10, 1928, with interest at 6%, was endorsed for payments as follows: April 10, 1928, $500; July 10, 1928, $500; October 10, 1928, $500; January 10, 1929, $500. How much was payable April 10, 1929?

2. A mortgage for $6000 was given January 2, 1926, bearing interest at 5%. The following payments were made: January 2, 1927, $2000; January 2, 1928, $2000. Find the amount to be paid on the due date, January 2, 1929.

3. A man purchased a house and lot for $6000, by paying $2000 cash and giving a purchase money mortgage for $4000, at 6% interest, on which he agreed to pay $100 per month until it was paid off. Interest was allowed on each payment from the time it was made, and the amounts paid were deducted from the principal and interest annually. How much did the house and lot cost him?

4. A farmer bought a tractor for $900. He kept it 4 months, paid $70 for repairs, and sold it for $800 on 6 months' credit. What was his loss, if money was worth 6%?

5. A creditor agreed to pay a debt of $3600 in 6 semiannual installments of $600 each, plus the interest at 6% per annum. What was the full amount of interest he had to pay?

6. On an invoice of goods amounting to $4860 trade discounts of $16\frac{2}{3}\%$ and 3% and a credit of 4 months were allowed. What should have been the total discount allowed for cash, money being worth 6%?

TAXES

Assignment 39A

1. A house and lot are assessed for $3500. If the tax rate in the town is $1\frac{5}{7}\%$, how much tax must the owner of the house pay?

2. A man's property was assessed at $28,400. If the tax rate was 18 mills on a dollar, how much tax did he pay?

3. How much tax will a man have to pay who owns 300 acres of land, assessed at $25 an acre, and personal property assessed at $3000, the tax rate being 8 mills on a dollar and the fee for collecting, 1%?

4. What is the rate of taxation when property assessed at $6800 pays a tax of $191.76?

5. All the taxable property in a village was assessed at \$785,400 and taxed \$13,744.50. (a) Find the tax rate. (b) The tax on property assessed at \$2650 was how much?

6. The assessed valuation of property in a certain town is \$3,488,600. The tax to be raised is \$78,493.50. What is the tax rate on \$1?

7. A tax of \$107.50 was paid on a house and lot when the rate was $1\frac{3}{4}\%$. For how much were they assessed?

8. In a certain village a tax of \$28,800 was raised on the taxable property when the tax rate was $1\frac{7}{8}\%$. What was the assessed valuation of the taxable property in the village?

Assignment 39B

1. In a certain city the assessed valuation of property is \$18,940,500, and the amount of tax to be raised is \$416,691. What must be the tax rate to raise this amount?

2. In a certain city the amount to be raised by taxes for schools is \$312,300, and the amount to be raised for city and state expenses is \$416,825. The assessed valuation of the property is \$30,700,000. What will be the tax rate in this particular year?

3. The valuation of the taxable property in a town is \$2,880,600. The amount of tax levied for the town's expenses is \$31,686.60. The tax rate for the county and state expenses is $4\frac{1}{2}$ mills. (a) Find the town's tax rate. (b) Find the total tax to be paid on property assessed for \$7700.

4. A man owns \$16,500 worth of taxable property. The total valuation of taxable property in his town is \$1,260,500. The expenses for schools are \$11,310.25, and for town, county, and state expenses, \$18,211.50. How much tax must he pay?

5. In a certain town, taxes are levied as follows: for salaries, \$17,800; for street improvements, \$12,400; for schools, \$9200; for sinking fund, \$4000; for incidentals, \$3500. The assessed valuation of the property is \$2,084,444.40. Find the tax rate to four decimal places.

6. The cost of the public schools of a city for a year was \$216,900, and the taxable property of the city was assessed at \$17,352,000. How many mills on a dollar must be paid for school purposes? (Carry the result to four decimal places.)

UNITED STATES DUTIES

Assignment 40A

1. A dealer imported 125 articles, each worth \$88. What is the ad valorem duty at 22%?

2. The duty on a certain commodity is 40¢ a pound and 25% ad valorem. Find the duty on 600 pounds of this commodity worth \$4800.

3. An importer paid an ad valorem duty of $4660 on goods valued at $18,640. Find the rate of duty.

4. Find the rate of ad valorem duty when $5139.20 duty is paid on goods valued at $23,360.

5. The total cost of an invoice of goods is $17,280. If the duty is 35% ad valorem, what was the original cost of the goods?

6. Goods valued at $6670 were imported. The total cost to the importer, including the ad valorem duty, was $8871.10. What was the rate of duty?

7. The duty on an invoice of goods at 28% was $1216.60, What was the total cost of the goods?

8. Find the entire cost in United States money, of an invoice of cotton stockings valued at £180, if the freight charges were £3, 12s., and the ad valorem duty was 30%. (£1 = $4.8665.)

Assignment 40B

1. A merchant imported ready-made woolen clothing invoiced at $28,520 and weighing 960 pounds. The freight was $1.80 per 100 pounds; the ad valorem duty was 45%, and the specific duty was 30¢ a pound. Find the total cost of the clothing.

2. A dealer purchased abroad 15,000 sq. yd. of oilcloth at 2s. per square yard. The specific duty was 3¢ per square yard and the ad valorem duty was 20%. Find the total cost of the oilcloth.

3. A stationer imported 24 gross of pencils, for which he paid 12s., 6d. a gross. The specific duty was 45¢ a gross, and the ad valorem duty was 25%. Find the total cost of the pencils.

4. An importer purchased in England 1200 yd. of carpet, $\frac{3}{4}$ yd. wide, at 12s., 6d. a yard. What was the total cost of the carpet, if the duty was 45¢ per square yard and 40% ad valorem?

5. A dealer purchased 50 gross of handkerchiefs in London at £2 6s., 6d. a gross. The duty was 55% ad valorem, and the freight to New York was $9.20. Find the total cost, if exchange is $4.8665.

6. A merchant imported 1200 doz. pairs of cotton stockings invoiced at £410, 8s. The duty was 30% ad valorem. Exchange to pay for the invoice was purchased at $4.875. How much per pair did the stockings cost?

7. Find the cost of 20 doz. silk handkerchiefs purchased in Paris, at 140 francs a dozen, on which a duty of 55% ad valorem and freight amounting to $6 were paid. For how much each should they be sold to gain 50% on the gross cost? (1 franc = 3.913¢)

8. Find the cost of 6 gross of pocket knives at 128 francs a dozen, on which the duty was 1¢ each and 50% ad valorem; and 3 gross of safety razors at 75 francs a dozen, on which the duty was 10¢ each and 30% ad valorem. (1 franc = $0.0391\frac{3}{4}$)

INSURANCE

Assignment 41A

1. A piece of property valued at \$8500 was insured for $\frac{4}{5}$ of its value for 3 years, at $1\frac{3}{4}\%$ premium. How much premium was paid?

2. Property valued at \$40,000 was insured for 80% of its value. What was the premium, if the rate was 50¢ per \$100 for 3 years?

3. O. E. Haver paid \$48 premium to insure his house for three years for \$12,000, which is 80% of its value. (a) Find the rate of insurance. (b) Find the value of the house.

4. A man paid \$91 for insurance on his house, which was valued at \$16,250 and insured for $\frac{4}{5}$ of its value. What was the per cent of premium which he paid?

5. A merchant paid \$312.50 premium every three years, at $\frac{5}{8}\%$ annually, for insurance on his store buildings. What was the amount of the policy?

6. A merchant paid \$405 once in three years, at $1\frac{1}{2}\%$, to insure his stock for 90% of its value. What was the value of the stock?

7. A man paid \$24.60 annual premium on a life insurance policy of \$1000. At this rate, what would it cost to carry a policy of \$5000 for 10 years?

8. A person paid an annual premium of \$54.50 per \$1000 on a 20-year endowment policy of \$3000. If he carried this policy for 20 years, how much did the premium cost him?

Assignment 41B

1. A building valued at \$20,000 was insured for $\frac{4}{5}$ of its value, at 50¢ per \$100 for 3 years; and its contents, valued at \$12,000, were insured for $\frac{3}{5}$ of their value, at 75¢ per \$100 for 3 years. What is the cost per year for carrying the insurance?

2. A building insured for \$16,000, at $\frac{1}{2}\%$ on a three-year policy, was damaged by fire to the extent of \$6000. The insurance company paid 80% of the loss. (a) What was the owner's net loss? (b) What was the company's net loss?

3. A building valued at \$30,000, and its contents valued at \$10,000, are insured for 60% of their value. Fire caused a loss of \$7500 to the building and \$4500 to the contents. The policy contained the 80% co-insurance clause. (a) Find the amount payable. (b) How much did the owner lose?

4. A public library building, valued at \$125,000, was insured for 80% of its value in four different companies. (a) If the rate is 40¢ per \$100 for 3 years, what is the total premium? (b) If the building is damaged by fire to the extent of \$50,000, how much will each company have to pay?

5. A man took out a 20-year endowment policy for $5000, on which he paid an annual premium of $225. When the policy matured, he received $5860. (a) How much more did he receive than he paid in? (b) Had he loaned his premium at 6% per annum, how much would he have had? (The first $225 would draw interest for 19 years; the second $225 for 18 years, etc. Use compound interest table.)

6. A man at the age of 26 took out a $10,000 twenty-payment life policy, on which he paid a premium annually of $286.40. He died after paying 10 premiums. (a) How much more did his heirs receive than he had paid in, if they received the face value of the policy? (b) How much would his insurance have cost him if he had lived to pay all premiums?

7. A man 30 years of age took out an endowment policy for $20,000 at an annual premium of $969.40 for 20 years. He died after making 8 payments. How much less would his insurance have cost him if he had taken out an ordinary life policy, on which the premium would have been $23.50 per $1000?

8. A business block was insured for $400,000. Within 8 months thereafter it was damaged by fire and water to the extent of $80,000. The risk was distributed as follows:

Hartford Company	$75,000
Pittsburgh Company	50,000
Standard Company	100,000
Provident Company	100,000
Phoenix Company	75,000

What was the net loss of each company, if the annual premium was 80¢ per $100?

STOCKS AND BONDS

Assignment 42A

1. A man bought, through his broker, 125 shares of B. and O. R. R. stock at $96\frac{1}{2}$; brokerage charge, $20 per 100 shares. How much did the stock cost him?

2. A speculator bought 250 shares of U. P. R. R. stock at $102\frac{1}{2}$ and sold it at $108\frac{3}{4}$. The brokerage charge was $25 per 100 shares both for buying and for selling the stock. How much did he gain, if the Federal tax was $5?

3. A banker invested $25,110 in N. Y. C. R. R. stock at $104\frac{3}{8}$. How many shares did he buy, if he paid $\frac{1}{4}$% brokerage?

4. A man invested $31,800 in mining stock at $5\frac{3}{4}$% above par ($100 par value); brokerage, $\frac{1}{4}$%. How many shares did he buy?

5. When 6% preferred stock is selling at $120, and the brokerage charge is $\frac{1}{8}$%, how much must be invested to produce an income of $3000?

6. When $4\frac{1}{2}$% bonds are selling at 90, and the brokerage charge is $\frac{1}{8}$%, how much must be invested to produce an income of $2250?

7. Find the annual income produced by an investment of \$11,137.50 in U. S. $4\frac{1}{2}$'s at $111\frac{3}{8}$.

8. What will be the amount of income derived from investing \$13,143.75 in 4% bonds at $87\frac{1}{2}$, if brokerage is $\frac{1}{8}\%$?

Assignment 42B

1. (a) What annual income is derived from investing \$45,000 in G. E. stock at 90, if a $2\frac{1}{2}\%$ semiannual dividend is declared? (b) This income is equal to what rate of interest on the amount invested?

2. The G. N. R. R. Co. declared a semiannual dividend of $2\frac{3}{4}\%$ on a capital stock of \$250,000,000. (a) What was the total semiannual dividend? (b) How much was the dividend paid to a stockholder who owned 4000 shares having a par value of \$100 per share?

3. Find the annual income of a speculator who invested \$16,340 in B. and A. stock at $81\frac{1}{2}$, paying a dividend of $5\frac{3}{8}\%$ annually; and \$14,467.50 in A. T. T. stock at $96\frac{1}{4}$, paying a dividend of $2\frac{7}{8}\%$ semiannually. Brokerage was 20¢ a share in both cases.

4. The capital stock of the Holmes Development Company is \$850,000. The gross earnings for the year are \$207,680, and the operating expenses, \$127,540. If 15% of the net earnings are set aside for a surplus fund, (a) what even per cent of dividend can be declared on the capital stock, and (b) how much is the undivided profit?

5. How much must be invested in N. P. preferred at $116\frac{1}{2}$, paying a semiannual dividend of $3\frac{1}{2}\%$, to yield an annual income of \$3500, if brokerage is 25¢ a share?

6. Which is the better investment and how much better: A. T. S. stock at $88\frac{1}{8}$, paying an annual dividend of $5\frac{3}{4}$, or G. N. stock at $108\frac{3}{8}$, paying an annual dividend of $6\frac{1}{4}$, brokerage being $\frac{1}{8}\%$ in each case? (Carry each result to two decimal places.)

7. A man invested \$12,000 in stock at par value, and received an annual dividend of \$690. (a) What was the rate of dividend he received? (b) If money is worth 6%, what would be the market value of his stock? (Stock fluctuations less than a whole number are given in eighths, or fourths $\frac{1}{8}$, $\frac{7}{8}$, $\frac{1}{4}$, $\frac{3}{4}$, etc.)

8. A man invested \$9862.50 in General Electric $5\frac{1}{2}\%$ bonds at $98\frac{1}{2}$; brokerage, $\frac{1}{8}\%$. He kept them for one year, received his interest, and then sold them for $102\frac{1}{4}$; brokerage, $\frac{1}{8}\%$. What per cent did he make on his investment?

Assignment 43A

1. Which would be the better investment; \$9915 invested in bonds at $82\frac{1}{2}\%$ paying 5%, brokerage, $\frac{1}{8}\%$; or the same amount invested in a house and lot that produces a net income of \$48.25 a month?

2. At what price per share was stock quoted, if 175 shares cost \$16,660, including brokerage at 20¢ per share?

3. A broker invested \$7060.50 for a customer. The broker charged 20¢ per share for buying the stock. What was the price per share, if 90 shares were bought?

4. At what price must stock, paying a dividend of 8%, be bought to yield an income of 6% on the amount invested?

5. What per cent of profit on the gross cost is made by buying stock at $95\frac{3}{8}$ and selling it for $103\frac{5}{8}$, brokerage being $\frac{1}{8}$% in each case?

6. What is the per cent of loss on the gross cost of stock bought at $112\frac{3}{4}$ and sold at $103\frac{1}{4}$, brokerage being $\frac{1}{8}$% in each case?

7. A certain company paid a dividend amounting to \$13,750 on a capital stock of \$250,000. (a) What was the rate of dividend? (b) How much dividend would a man receive who owns 40 shares of stock, par value of \$100 each?

8. Municipal bonds bearing $4\frac{1}{2}$% interest sell for $102\frac{1}{2}$. What per cent of return does the buyer get on his investment? (Find result to the nearest hundredth.)

Assignment 43B

1. A corporation with a capital stock of \$250,000, of which \$150,000 is common stock, and \$100,000 is 6% cumulative preferred stock, had net earnings for the year amounting to \$15,963.33 (a) What dividend, to the nearest $\frac{1}{4}$%, can be declared on the common stock after putting 10% of the net earnings in the surplus fund and paying the dividend on the preferred stock? (b) How much will remain in undivided profits?

2. The capital stock of a corporation is \$500,000, of which \$250,000 is 7% non-participating preferred. The directors made \$28,750 of net earnings available for dividend purposes. One stockholder has 50 shares of preferred stock and 75 shares of common stock. How much dividend would he get?

3. The stockholder in the preceding problem paid \$120 per share for preferred stock and \$85 per share for common stock. His dividend on each was equal to what annual rate of interest on the amount invested in each kind of stock?

4. How much should be paid for stock paying a dividend of $5\frac{1}{4}$% on \$100 par value, in order that the interest on the money invested shall be 6% per annum?

5. J. W. Harding sent \$20,000 to his broker to be invested in Bethlehem Steel 7% preferred stock at $122\frac{1}{4}$. Brokerage was \$25 per 100 shares. (a) How many shares did the broker buy? (b) How much was the unexpended balance?

6. Find (a) the total amount invested and (b) the total dividend for an investor who owns the following stocks:

100 sh.	Am. Sugar 7% pf. at 108
200 sh.	Chicago & Northwestern R.R. 7% pf. at $136\frac{3}{4}$
50 sh.	U. S. Steel 7% pf. at $141\frac{3}{8}$
150 sh.	Western Union Tel. 8% stock at $197\frac{1}{2}$

7. O. E. Haver bought 100 shares of Gen. Motors stock at \$82 per share; brokerage, \$20. He kept the stock one year, received $5\frac{1}{2}$% dividend, and then sold it for $95\frac{3}{8}$ per share; brokerage, \$20. If the money he invested was worth 6% interest, how much profit did he make over and above the interest on his investment? (Federal tax on stock sold, 2¢ a share.)

8. A speculator bought 50 shares of Am. Locomotive stock at $109\frac{1}{2}$ on a 10% margin. The stock was sold 30 days later for $107\frac{3}{8}$, brokerage for buying and for selling being \$25 per 100 shares and Federal tax on stock sold, 2¢ a share. If the broker charged 6% interest on the money he advanced, how much did the speculator lose? (The broker advanced or loaned the speculator the difference between the 10% margin (\$548.75) and the cost of the stock.)

EXCHANGE PROBLEMS

Assignment 44A

1. A Chicago banker bought a 60-day draft for \$1500 on a Buffalo firm, at $\frac{1}{8}$% discount. Find the cost of the draft, money being worth 6%.

2. Find the face of a 30-day draft that can be bought for \$1207.50, premium being $\frac{1}{8}$% and interest 6%.

3. A merchant in Omaha drew a 90-day draft on a Chicago firm for \$3000. Ten days after date he sold the draft at a discount of $\frac{1}{4}$%, interest being 6%. What did he receive for the draft?

4. If exchange on New York is at a premium of $\frac{1}{10}$%, what is the face of a draft that can be bought for \$15,015?

5. If exchange is at a discount of $\frac{3}{10}$%, what is the face of a draft that can be bought for \$12,462.50?

6. A wholesale merchant in Boston drew a sight draft on a customer in Atlanta for \$9640. He sold it to the Seaboard National Bank at $\frac{3}{8}$% discount. How much were the proceeds?

7. Jackson & Co. drew a 60-day draft on Morgan & Co. for \$3600, and had it discounted at the Merchants Bank. If the rate of discount was 6% and the rate of collection $\frac{1}{10}$%, what were the proceeds?

8. Find the cost of a draft for \$38,940 at 25¢ per \$1000 premium.

Assignment 44B

1. A merchant purchased a $5000 draft for $4985. (a) What was the rate of exchange, and was it at a premium or at a discount? (b) At this rate of exchange, find the face of a draft that can be bought for $4556.29.

2. A dealer bought goods invoiced at $16,480.80, less 5% for cash or 90 days' credit. To take advantage of the discount offered, he purchased a draft at $\frac{1}{4}$% premium. How much profit did he make by the transaction?

3. A manufacturer drew a 60-day draft on a dealer for $4450 and sold it to the Farmers Bank. The collection was $\frac{1}{5}$%, and the interest 6%. Find the proceeds.

4. Find the cost of a draft for £800, 4s., 8d. at $4.875.

5. A Boston merchant owed a firm in Paris 48,400 francs. Find the cost of a draft to pay this amount, if the exchange rate is $3.91\frac{1}{8}$¢ a franc.

6. (a) Find the cost in English money of a draft on London for $2418 if the exchange rate is $4.87\frac{1}{2}$. (b) Find the cost in French money of a draft on Paris for $1567, if the rate of exchange is $3.91\frac{3}{4}$¢.

7. Change $3000 (a) to English money; (b) to French money; (c) to German money. (£1 = $4.8665; 1 franc = 0.0391\frac{3}{4}$; 1 mark = $0.238.)

8. An exporter in London drew a draft on a Baltimore importer for £1240, 12s., 6d. How much did the importer have to pay, if £1 was quoted at $4.87?

EQUATION OF ACCOUNTS

Assignment 45A

1. Harper used $150 of Snow's money for 60 days. How much of Harper's money should Snow use for 15 days to counterbalance the accommodation?

2. If a man pays $300 on an account 90 days before it is due, how long should he be allowed to let an account of $450 run after it is due, as an equal adjustment?

3. On June 1, Adams sold Howe, on 60 days' credit, a bill of goods amounting to $400. If a payment of $200 is made on July 1, on what date is the balance equitably due?

4. Find the equated date of the following account: H. J. Slater, Dr., May 5, $300; Dr., June 14, $450; Dr., July 9, $700.

5. Find the average due date of the following charges:

1929		
April 4,	Mdse.,	$250
May 10,	Mdse.,	$400
June 14,	Mdse.,	$500

6. Find the date on which the following accounts may be paid in one amount without loss to either party:

June 2, 1929, Mdse., 60 days, $500
June 26, 1929, Mdse., 30 days, $400
July 23, 1929, Mdse., 30 days, $600

Assignment 45B

1. When may the following bills be paid in one amount without loss to either party?

Jan. 2, 1929, Mdse., 30 days, $350
Feb. 6, 1929, Mdse., 10 days, 450
Mar. 12, 1929, Mdse., 30 days, 650
Apr. 9, 1929, Mdse., 15 days, 200

2. Find the equated date for paying the balance of the following account:

1929	*Dr.*	1929	*Cr.*
Apr. 5 Mdse.,	800	May 5 Cash	500
May 10 Mdse.,	1200	June 6 Cash	1000

3. Equate the following account:

L. B. Roberts

1929					1929				
July	2	Mdse., 60 days	900		Sept.	30	Cash	700	
Aug.	1	Mdse., 90 days	800		Oct.	12	Cash	1000	
Sept.	3	Mdse., 30 days	1000						

4. Equate the following account:

J. H. Horne

1929					1929				
Apr.	2	Mdse., 90 days	1200		July	1	Cash	1000	
May	7	Mdse., 60 days	1500		July	6	Cash	1500	
June	11	Mdse., 30 days	1800						

5. Find the cash balance of the following account on Sept. 3, 1929, money being worth 6% interest:

H. E. Stratton

1929					1929				
May	1	Mdse., 60 days	1400		July	26	Cash	1200	
June	12	Mdse., 60 days	1700		Aug.	30	Cash	1500	
July	2	Mdse., 60 days	2200						

6. Assuming money to be worth 6% interest, find the cash balance on April 30, 1929, of the following account:

M. E. LOWERY

1929					1929				
Jan.	2	Mdse., 60 days	700		Feb.	16	Cash	500	
Feb.	20	Mdse., 60 days	900		Apr.	8	Cash	1000	
Mar.	19	Mdse., 30 days	1250						

PARTNERSHIP

Assignment 46A

1. Manning and Moore engaged in the grocery business. Manning invested $4000, and Moore invested $3000. The net profit for the year was $5200. If each partner drew a salary of $100 per month, and the remainder of the net profit was divided in proportion to their respective investments, how much should each partner receive?

2. *A*, *B*, and *C* invested in a coal business equal sums, amounting in all to $21,000. Their gross profit for the year was $18,460, and their total expenses, including each partner's salary of $150 per month, were $12,962.50. What was each partner's share of the profit?

3. Two partners paid $32,000 for a canning business. *C* paid $12,000, and *D* paid the remainder. They operated the plant for one year at a net profit of $7400, and then sold out all their interests in the business for $40,000. Find each partner's share of the profit in proportion to his investment.

4. Three partners invested a total capital of $120,000 in a business. Later $24,000 of the net profit was divided, according to the amount invested by each, as follows: *A* received $6000; *B* received $8000, and *C* received $10,000. How much did each partner invest?

5. Three partners engaged in business and invested $12,000, $16,000, and $22,000, respectively. The first year their net profit was $9600, which was divided in proportion to investments. Find the present worth of each partner at the close of the year's business.

6. *A*, *B*, *C*, and *D* were partners in a lumber business, *A* invested $15,000; *B* invested $20,000; *C* invested $25,000, and *D* invested $10,000. At the end of the first year there was a net loss of $15,400. Find the present worth of each partner in proportion to his investment.

Assignment 46B

1. The firm of Baker and Barber showed assets of $38,600 and liabilities of $6200. Baker invested $12,000, and Barber invested $8000. (a) Find the net gain. (b) Find the present worth of each partner.

2. A, B, and C formed a partnership. A invested \$15,000 for 15 months; B invested \$10,000 for 9 months, and C invested \$7500 for 6 months. The net gain was \$7200. Find each partner's share in proportion to his average investment.

3. Bates and Gates formed a partnership for two years, each investing \$12,500. Six months later Bates invested \$2500 more, and Gates drew out \$1500. At the end of the two years their assets amounted to \$47,800 and their liabilities amounted to \$5400. What was the present worth of each partner at the time of dissolution?

4. Of three partners in a plumbing business, E invested \$6000; F invested \$5000; G invested \$4000. The gain for the year was \$12,600. After 6% interest was allowed for the year on each partner's investment, and each partner drew a salary of \$40 per week, the net gain was divided in proportion to their respective investments. Find each partner's present worth.

5. G and H entered into a partnership July 2, 1928. G invested \$15,000, and H invested \$10,000. On January 2, 1929, G withdrew \$1000 and H invested \$2000. At the end of the year the net gain was \$11,200, which the partners agreed to share in proportion to average investment. Find each partner's present worth.

6. Adams and Brown engaged in business with a capital of \$12,000. Adams invested $\frac{7}{12}$ and Brown invested $\frac{5}{12}$ of this amount. At the beginning of the second year Adams invested \$3000 additional and Brown invested \$2500. At the end of two years their assets were \$28,750 and their liabilities were \$1100. What was each partner's present worth in proportion to his average investment?

REVIEW

Assignment 47A

1. If 28 doz. eggs cost \$15.68, how much will 389 doz. cost at the same price per dozen?

2. Find the cost of sending a package that weighs $11\frac{1}{2}$ pounds, a distance of 1560 miles by parcel post.

3. A dealer bought 320 tons of coal at \$7.80 a ton. He sold $\frac{5}{8}$ of it for \$11.60 a ton, and the remainder for \$11.25 a ton. He paid \$352 freight, and \$1.25 a ton for delivering it. How much profit did he make?

4. A salesman receives a salary of \$250 a month. If his expenses average \$50 a week, how long will it take him to save enough money to pay for a building lot that costs \$1200?

5. Reduce 3 yd., 2 ft., 6 in. to the decimal fraction of a rod.

6. What are the dimensions of a square room the floor of which contains 225 sq. ft.?

7. What is the length of a field 78 rods wide that contains 11,115 sq. rd.?

8. Find the cost, at $12.50 per M., of the brick required to build a sidewalk 3 ft. wide, on the outside corner of a lot 125 ft. long by 75 ft. wide, if 9 bricks will lay 1 sq. ft.

Assignment 47B

1. A factory employed 2840 men, at $4.80 per day of 8 hours each, for $5\frac{1}{2}$ days a week. On October 1, wages were increased 6¢ an hour for a 44-hour week. How much was the weekly pay roll increased?

2. A farmer sold 240 bu. of wheat, for $1.45 a bushel, to a miller who made 49 pounds of flour from each bushel. The miller sold the flour for $8 a barrel. How much did he gain?

3. A dealer buys oranges at 24¢ a dozen and sells them at the rate of 3 for 10¢. How many dozen will he have to buy and sell in order to gain $13.60?

4. A coal dealer purchased 180 long tons of coal at $6.75 a long ton and sold it for $9.60 a short ton. How much did he gain?

5. Find the cost, at $18.75 a square rod, of paving a street which measures $49\frac{1}{2}$ ft. from curb to curb and is 120 rd. long.

6. Find the cost, at $8.75 per M., of the number of brick $8'' \times 4''$ required when laid flat, to pave a walk 3 ft., 4 in. wide and 160 ft., 8 in. long.

7. How many acres are there in a field the sides of which measure 40 rd. and 60 rd. respectively, and the distance between the sides of which is 48 rd.

8. How many square feet are there in the two gable ends of a barn that is 60 ft. wide, if each gable end measures 15 ft. from cornice to ridge?

Assignment 48A

1. Multiply 2 lb., 4 oz., 7 pwt., 12 gr. by 16.

2. The hypotenuse of a right-angled triangle is 50 ft. and the altitude is 30 ft. Find the length of the base.

3. How many board feet are there in a timber $10'' \times 12,''$ and 12 ft. long?

4. How many square yards of surface are there in the walls and ceiling of a room 22 ft. long, 18 ft. wide, and $8\frac{1}{2}$ ft. high, if we deduct 66 sq. ft. for openings?

5. How much will it cost, at $2.70 per cubic yard, to excavate for a cistern 6 ft. in diameter and 8 ft. deep?

6. What will be the cost, at $2.25 per square yard, of linoleum 2 yd. wide required to cover a floor 21 ft. long and 12 ft. wide, if $1\frac{1}{2}$ sq. yd. were allowed for waste in matching?

7. How many common brick will be required to lay a wall 64 yd. long, 15 in. thick, and $4\frac{1}{2}$ ft. high, if 22 bricks lay a cubic foot?

8. Find the area of a trapezoid whose parallel sides are 24 ft. and 18 ft., and whose altitude is 16 ft.

Assignment 48B

1. The base of a right-angled triangle is 40 ft. and the altitude is 30 ft. Find (a) the hypotenuse and (b) the number of square yards in the area.

2. Find the area in square feet of the largest circle that can be cut from a sheet of copper 4 ft. square.

3. How many rods of fence will be required to enclose a square field containing 10 acres?

4. Find the capacity in even barrels of a tank 3 ft. wide, 4 ft. deep, and 12 ft. long.

5. How much will it cost, at \$1.10 per cubic yard for earth, and \$2.75 a cubic yard for rock, to excavate for a cellar 54 ft. long, 26 ft. wide, and 5 ft. below the surface, if $\frac{3}{5}$ is rock?

6. Find the cost, at 11¢ per square foot, of the metal required for the sides and bottoms of 24 containers 2 ft. long, $1\frac{1}{2}$ ft. wide, and 1 ft. deep.

7. (a) What is the cost, at \$10.80 per M., of the lath required for the walls and ceiling of a room 22 ft. by 18 ft. and 8 ft., 6 in. high, if 1000 lath cover 60 sq. yds.? Allow for 4 windows $3' \times 5'$ and 1 door $3' \times 7'$. (b) How much will it cost to put these laths on at 55¢ per bundle of 100 lath? (Only whole bundles are sold.)

8. At \$1.75 a bundle of 250 shingles, how much will it cost to shingle a roof 44 ft. by 28 ft. on each of two sides, if the shingles are laid 5 in. to the weather, and the cost of laying is \$1.20 per bundle? (Only whole bundles are sold.)

Assignment 49

1. Find the cost of the following, at \$4.50 a pound: 8 lb., 11 oz., 12 pwt.; 9 lb., 8 oz., 15 pwt.; 14 lb., 6 oz., 10 pwt.; 11 lb., 4 oz., 10 pwt.

2. Find the cost of 1780 lb. of hay at \$22.00 per ton; 1560 lb. of straw at \$14.00 per ton, and 1536 lb. of oats at 67¢ a bushel.

3. A circular plot 40 yd. in diameter is enclosed with an iron fence, at a cost of \$10.80 per rod. How much did the fence cost?

4. A man bought furniture and made a payment of \$180 cash. He still owed $\frac{3}{8}$ of the price he agreed to pay. (a) How much remains unpaid? (b) How much did the furniture cost him?

5. How much will it cost, at \$1.80 per yard, to carpet a stairway of 18 steps? The tread of each step is 10 in. and the riser is 7 in.

6. Reduce 2 pk. and 5 qt. to the decimal fraction of a bushel.

7. The capacity of a bin is 800 bu. If its length is 20 ft., and its width is 10 ft., how deep is it? (A cubic foot equals approximately four-fifths (.8) of a bushel.)

8. In a schoolroom, 40 pupils are seated. Allowing 15 square feet of floor space for each pupil, what should be the other dimension of the room, if it is 24 ft. wide?

Assignment 50

1. A schoolroom seats 36 pupils. Allowing 200 cu. ft. of air space for each pupil, how high is the room, if it is 24 ft. long and 20 ft. wide?

2 Adams, Murray, and Small contracted to do a piece of work for $720. Adams worked 31 days; Murray worked 24 days, and Small worked 25 days. How should the money be divided?

3. A dealer bought a quantity of apples for $585. By selling them for $5.40 per barrel, he gained $\frac{1}{5}$ of their cost. (a) How many barrels did he buy? (b) How much did he gain?

4. A dealer mixed 80 lb. of coffee at 28¢ a pound; 80 lb. of coffee at 32¢ a pound, and 90 lb. of coffee at 36¢ a pound. He sold the mixture at 42¢ a pound. (a) What was the average cost of the mixture? (b) How much profit did he make?

5. Find the cost of 15 sills, each $8'' \times 10''$, and 16 ft. long, at $48.00 per thousand board feet.

6. A contractor agreed to excavate a drain 2000 ft. long, 3 ft. deep, and 2 ft. wide, at $1.35 per cubic yard. The labor for digging and hauling cost him $1.11 a cubic yard, and he sold the dirt for 30¢ per cubic yard. How much profit did he make on the job?

Assignment 51

1. A farmer owns a farm 280 rd. long and 80 rd. wide. He divided this farm into 4 rectangular fields and enclosed each field with a wire fence, at a cost of 90¢ a rod. (a) How much did the fence cost him? (b) What is the land worth at $200 per acre?

2. A farmer desires to build a bin large enough to hold 600 bu. of grain. If he builds it 15 ft. long and 5 ft. wide, how high will it have to be? (One bushel is equal to $1\frac{1}{4}$ cubic feet.)

3. (a) Find the approximate capacity in quarts of a can 18 in. in diameter and 3 ft. high. (b) What fractional part of a hogshead (63 gallons) does this can hold? (There are approximately $7\frac{1}{2}$ gal. in 1 cu. ft.)

4. Reduce 12 cwt., 80 lb. (a) to the fraction of a ton; (b) to the decimal fraction of a ton.

5. How many acres are there in a triangular field whose sides measure 60 rd., 80 rd., and 100 rd.?

6. What is the difference in the area of a square measuring 30 ft. on a side and a circle with a diameter of 30 ft?

PERCENTAGE REVIEW

Assignment 52

1. A maker of automobile tires estimated that his factory buildings would depreciate 4% each year and that his machinery would depreciate 10% each year. The buildings were valued at $800,000 and the machinery was valued at $1,500,000. Find the value of each at the end of the fourth year. (Reckon the depreciation each year on the original value.)

2. An office building valued at $250,000 was insured in one company for $50,000, in another company for $75,000, and in a third for $75,000. (a) For what per cent of its value was it insured? (b) What per cent of the insurance did each company carry?

3. A woman purchased a $700 piano on the installment plan by paying $200 cash and $45 a month for 12 months. (a) How much did the piano cost her? (b) What was the per cent of increase in price in buying by this plan?

4. A man bought a tractor and a wagon for $880. The wagon cost $14\frac{2}{7}$% of the cost of the tractor. Find the cost of each.

5. A man failed in business with assets amounting to $9200 and liabilities amounting to $13,800. (a) How much can he pay on the dollar? (b) How much will a creditor receive whom he owes $1233.60?

6. A dealer was offered a quantity of rugs for $28,600, less 10%, 5%, and 2% discount with 60 days' credit, or 20% discount for cash. If money is worth 6%, which is the better offer, and how much better?

7. *D*, *E*, and *F* are partners in a business which shows a profit of $15,780 for the year. *D* invested $9500; *E* invested $12,000, and *F* invested $8500. After 6% interest on each partner's investment for the year has been deducted from the profit, find each partner's share of the remainder in proportion to his investment.

8. A man is paying $100 per month rent for a house which he can buy for $11,000. (a) Should he continue to pay rent, if money is worth 6% and the expenses of this property amount to $412.70 a year? (b) How much would he save by buying the house?

Assignment 53

1. A coal dealer who had 480 tons of coal sold $33\frac{1}{3}$% of it for $14.75 a ton; 40% of what remained for $14.50 a ton, and the remainder at $14.25 a ton. (a) How much did he receive for all? (b) At what average price per ton did he sell it?

2. D. E. Case & Company, Seattle, Washington, bought the following items from Mason, Hammon & Co., Boston, Mass., terms 6/10, 3/30, n/90:

7 pcs. Woolen Serge 48^2, 49^1, 47^3, 48^1, 47^2, 46^3, 44^2 at $3.95

6 pcs. Woolen E. Clay 43^1, 46^2, 45^1, 42^3, 47^2, 46^1 at $4.38

Make out the bill in correct form, and find the amount if the bill is paid in 10 days.

3. Ash cans were listed at \$4.20 each, less $16\frac{2}{3}\%$ and 3%. A dealer ordered 4 doz. at this price and sold them at \$6 less $12\frac{1}{2}\%$. (a) How much did he make? (b) What per cent of profit did he make on the net cost?

4. A planter shipped 34,500 pounds of cotton to a commission merchant. The merchant sold the cotton. After paying \$142.30 expenses and deducting his commission of 3%, he remitted the proceeds, amounting to \$7554.65, to his principal. For how much a pound did he sell the cotton?

5. Find the interest on \$15,962.45 at $4\frac{1}{2}\%$ from May 16, 1928, to April 4, 1929. Find the time in months and days.

6. A man bought an oil heater for \$985. He paid \$285 cash and gave his note for 9 months at 6% interest for the balance. The note was dated Jan. 7, 1929, and discounted 10 days later at 6% by the payee. Find the proceeds.

7. Green held an 8-months' note dated June 5, 1929, for \$1180 at 6% interest. He had this note discounted at the Commercial Bank on August 6 at 6%. Find the bank discount and the proceeds.

8. On a note for \$1600 dated May 6, 1927, with interest at 6%, the following payments were endorsed: Aug. 9, 1927, \$500; Nov. 14, 1928, \$400; Feb. 1, 1929, \$200. How much was due May 6, 1929?

Assignment 54

1. On April 6, 19—, a dealer bought an invoice of goods amounting to \$1458, on the following terms: 8% at 10 days, or net at 4 months' credit. He discounted his 4 months' note at the bank at 6% and paid cash for the goods. How much did he gain?

2. A merchant bought lamps for \$12.80 each, less $12\frac{1}{2}\%$ and 3% discount. At what price must he mark the lamps so that his profit on the net cost will be 50%, after allowing his customer 10% discount?

3. (a) Find the compound interest, at 5% annually, on \$1630 for 3 years. (b) Find the amount at the end of this time.

4. The property in a certain town was assessed for \$2,962,400, and the amount of tax to be raised was \$66,654. (a) What was the tax rate? (b) How much were the taxes on a piece of property assessed for \$4350?

5. Property valued at \$40,000 is insured for 80% of its value in three different companies, as follows: one company carried \$12,000, and two other compaies \$10,000 each, for 3 years, at a premium of 60¢ per \$100. The property was damaged to the extent of \$24,000. (a) How much would each company have to pay? (b) What would be each company's net loss?

6. A speculator bought 200 shares of W. U. stock at $198\frac{1}{2}$. He kept the stock 6 months, received a dividend for the six months of $8\frac{1}{4}\%$, and then sold it for $195\frac{3}{4}$; brokerage, 25¢ a share both for buying and for selling.

(a) How much did he make? (b) His profit was equal to what rate of interest on the amount invested? (Federal tax is 2¢ a share on stock sold.)

7. Which is the better investment: bonds purchased at $102\frac{1}{2}$, paying $5\frac{3}{4}\%$ interest, or bonds purchased at $83\frac{3}{4}$, paying $4\frac{1}{2}\%$ interest? (No brokerage charge.)

8. How much will a man have to invest in bonds paying $2\frac{3}{4}\%$ interest semiannually in order to realize an annual income of $8250, if brokerage is $\frac{1}{8}\%$?

Assignment 55

1. An owner of an office building received from it as rental a gross annual income of $128,400. His expenses were as follows: taxes, $12,800; janitor service, $18,200; water, fuel, and light, $3150; repairs, $5120, and incidentals, $1130. For how much should this building be valued in order that the owner may realize 8% interest on the valuation?

2. The net amount of an invoice of goods was $1298.30 and the discounts were 20%, 8%, and 2%. Find the amount of the invoice before the discounts were taken.

3. Using the marking key "Who can time," mark the selling price of an article that cost $30, less 15%, and is marked to sell at a profit of 50% of the net cost.

4. An agent was directed by his principal to buy 2000 pairs of gloves at $1.85 a pair. He charged 2% for buying and packing. The other charges were: express, $9.20, and storage, $5.30. For how much a pair must the principal sell these gloves in order to make a profit approximating $66\frac{2}{3}\%$?

5. For what amount must a merchant, who wishes to secure a loan at a bank, give his 4 months' 6% interest-bearing note, dated April 4, 19—, in order that, when it is discounted at 6%, the proceeds will be sufficient to pay a bill of $3552.60?

6. Find the state income tax, if there is a State Income Tax Law in your state, and also the Federal income tax on the following incomes: *H*'s income is $42,150; *I*'s income is $12,780; and *J*'s income is $17,660. *H* is married and has 4 dependents; *I* is unmarried, and *J* is married.

7. How much should be paid for a $500,000 issue of city bonds at $4\frac{3}{4}\%$ in order that there might be an income of 5% on the investment?

8. A merchant in New York owes a Paris exporter 128,490 francs. If the rate of exchange is $.0392, what will a draft cost in New York to settle this account?

Assignment 56

1. A man failed in business owing his creditors $42,300. If his assets are $29,610, (a) how much can he pay on a dollar of his indebtedness? (b) How much will a creditor receive whom he owes $2960?

2. A dealer bought 85 harrows for \$52.50 each, terms 6/10 or n/90 da. He gave his 90-day note for such an amount that, when he had the note discounted at the bank on May 6, the proceeds would just pay the net cash price of the harrows. (a) What was the face of the note? (b) How much did he gain by paying cash?

3. Which is the better investment, and how much better: bonds purchased at $88\frac{3}{4}$, paying $4\frac{1}{2}\%$ interest, or bonds purchased at $102\frac{1}{2}$, paying $5\frac{1}{2}\%$ interest?

4. How much will a draft for 31,200 marks cost at $\$.95\frac{1}{4}$? How many marks will a draft for \$1905 purchase at $\$.95\frac{1}{4}$? (4 marks = $\$.95\frac{1}{4}$)

5. A merchant imported from England 700 doz. pairs of stockings invoiced at £472, 12s. The duty was 50% ad valorem, and other charges were \$78.15. For how much a pair must he sell the stockings to make a profit of $66\frac{2}{3}\%$? (£ = \$4.8665)

6. If \$10,000 worth (par value) of $5\frac{1}{2}\%$ bonds were sold for $92\frac{1}{4}$, and the proceeds were invested in 6% bonds at $102\frac{1}{2}$, will the income be decreased or increased, and how much?

7. In a certain city the valuation of the property to be taxed was \$342,864,750, and the amount to be raised by taxation was \$7,543,024.50. How much tax would a man have to pay whose property was assessed for \$18,800?

8. A man was offered \$1800 for a building lot, but, as this was 20% less than he paid for it, he refused to sell. Later he sold the lot for \$2500. Did he gain or lose, and how much?

GENERAL REVIEW

Assignment 57

1. Find the cost, at \$12.25 a cord, of a pile of wood 4 feet wide, 128 feet long, and 6 feet high.

2. How much will it cost, at 55¢ per square yard, to apply two coats of paint to the outside of a house 62 ft. long, 38 ft. wide, and 19 ft. to the eaves, if the two gable ends are 38 ft. long and $9\frac{1}{2}$ ft. from the cornice to the ridgepole? (A fraction of a yard is reckoned as a whole yard.)

3. Beans that cost \$4.80 per bushel (of 60 lb.) lost 20% in drying. For how much per pound must they be sold in order to make a profit of 50%?

4. How much should be invested in stock at $132\frac{1}{4}$, paying a semiannual dividend of $3\frac{1}{4}\%$, in order to realize an annual income of \$6500?

5. A man can rent the store in which he is doing business for \$6000 a year. He can buy the building and the lot on which it stands for \$75,000. The taxes are \$620; insurance, \$120, and repairs, \$550 a year. If his

money is worth 7% to him in his business, which is the better proposition for him, and how much better: to buy the store, or to continue to rent it?

6. A dealer bought 15,800 lb. of cotton in Memphis for $17\frac{1}{2}¢$ a pound and shipped it to New York, where it was sold for him, at 22¢ per pound. The commission merchant who sold the cotton charged $2\frac{1}{2}\%$ commission. The freight to New York was $468, and there was a storage charge of $26.50. How much did he gain?

7. Three partners gained $37,600 in two years. *A* invested $20,000; *B* invested $24,000, and *C* invested $16,000. After allowing each partner 6% interest on his investment, the gain was divided equally among the partners. How much did each partner receive?

8. Find the present worth of a debt of $16,960 due in 10 mo., if money is worth 6%.

Assignment 58

1. The net amount of an invoice of 3400 yd. of silk, after 20% and 5% discount had been deducted, was $4134.40. What was the gross price per yard?

2. A sewing machine was bought for $100, less 20% and 5%, and marked to sell at a profit of 50% of the net cost after allowing the purchaser 5% discount. Find the marked price.

3. J. C. Hammond had his 90-day note for $2500, dated July 5, 1929, at 6% interest, discounted at the bank July 15, 1929, at 6%. Find the net proceeds.

4. A man owned a store building from which he received a net annual income of $12,800. He sold the store building for $210,000 and invested this amount in preferred stock at 105. How much did he increase or decrease his annual income, if the stock paid $3\frac{1}{2}\%$ dividend semiannually?

5. A piano dealer offered a piano for $650 cash, or $150 cash and $45 per month for 12 months. If the cost of insurance was $2.20 a year, what annual rate of interest did the dealer charge on the deferred payments?

6. Equal quantities of tea costing 32¢, 36¢, and 40¢ a lb., respectively, are mixed and sold for 50¢ a lb. (a) What per cent of profit was made on the mixture? (b) How much profit was made on 500 pounds?

7. Find the cost of dividing a square field containing 160 acres into 4 fields of 40 acres each, with a wire fence costing $1.40 per rod, each field to be completely enclosed.

8. What will it cost to build a cement walk $3\frac{1}{2}$ ft. wide on the outside of a corner lot, 100 ft. on a side, at 48¢ per square foot?

Assignment 59

1. How much will it cost, at $2.25 per square yard, for linoleum to cover a hall 84 ft. long and 44 ft. wide, allowing 3 sq. yd. for waste in matching?

2. If 22 bricks lay a cubic foot, what will be the cost, at \$14.50 per M., of the bricks required to build a cellar wall 42 ft. on each side, and 28 ft. on each end (outside measurements), 7 ft. high and 18 in. thick, if we deduct $\frac{1}{10}$ for openings?

3. An English exporter sold to a Philadelphia merchant 300 yd. of English twill at 12s., 6d. a yard. The duty was 40% ad valorem, and the freight, £8, 3s. The merchant sold the cloth at a gain of 30% of the gross cost. What was his gain in U. S. money, if exchange was \$4.875?

4. A dealer is offered goods listed at \$1383.50, terms 20%, 10%, and 5% discount 60 days' credit, or 35% discount for cash. (a) How much will he make by discounting his note for 60 days at 6% and paying cash for the goods? (b) Find the face of a note of which, when it is discounted, the proceeds will just pay the net cost of the goods.

5. A company's net earnings for the year were \$128,360. The amount of common stock is \$1,250,000, and of preferred stock, \$600,000. The directors declared a dividend of 8% on the preferred stock. (a) What even rate of dividend can they declare on the common stock, and how much will remain in undivided profit account? (b) How much would a stockholder receive who holds 50 shares of common stock and 50 shares of preferred stock, par value 100?

6. The Globe Insurance Company insured a stock of goods for \$135,000 at $\frac{2}{3}$% premium, and reinsured $\frac{2}{3}$ of the risk in the St. Paul Company for $\frac{3}{5}$% premium. The goods were totally destroyed by fire. How much was each company's net loss?

7. A 6% interest-bearing note for \$3,000, given June 10, 1928, has payments endorsed on it as follows: Aug. 16, 1928, \$500; Nov. 6, 1928, \$500; Jan. 15, 1929, \$1000. How much was due June 10, 1929?

8. A dealer sold goods amounting to \$3030 on 60 days' credit. He took in payment a note at 6% for such an amount that, when it was due, the face of the note plus the interest for 60 days just equalled the amount of the bill. Find the face of the note.

Assignment 60

1. G. H. Gates and Company of Detroit, Mich., purchased from H. E. Harper and Company, Boston, Mass., terms 5/10, n/60, the following:

7 pcs. F. & L. cotton 42^1, 43^2, 45^1, 46^3, 45^2, 41^1, 47^3 at $11\frac{1}{2}$¢
6 pcs. L. B. muslin 39^2, 38^1, 34^3, 41^1, 43^2, 40^3 at $13\frac{3}{4}$¢
6 pcs. F. delaine 35^3, 39^2, 41^1, 38^2, 39^1, 41^2, at $16\frac{1}{2}$¢

Make out a bill in correct form and show net amount for cash.

2. On July 6, Mr. Hayes deposited \$20,000 with his broker and directed him to buy 200 shares of G. L. stock at $99\frac{3}{4}$. On July 25 he directed his broker to sell. The stock was sold for $107\frac{1}{4}$. If the broker charged \$20 per 100 shares for buying and \$25 per 100 shares for selling, how much did

Mr. Hayes make? (Federal tax on stock sold, 2¢ a share and state tax, 2¢ a share.)

3. A retailer sold a table for $140 at a profit of 40% of the cost. The jobber who sold the table to the retailer made 25% profit, and the manufacturer who sold it to the jobber made 25%. How much did the table cost the manufacturer?

4. The net proceeds of a consignment were $1493.60, after deducting 3% commission and $19.60 in charges. For how much did the consignment sell?

5. Find the cost of the following lumber required to build a boat landing:

8 pcs.	$6'' \times 6'' \times 12'$	@	$48 per M.
20 "	$2'' \times 6'' \times 16'$	@	54 per M.
10 "	$2'' \times 4'' \times 12'$	@	55 per M.
250 boards	$1'' \times 8'' \times 12'$	@	52 per M.

6. Find the cost, at $4.50 per square yard, of building a cement walk 4 ft. wide on two sides of a corner plot 200 ft. square.

7. A dealer bought shoes at $6 a pair, less 10% and 5%. He marked them to sell at a profit of $66\frac{2}{3}$%, after allowing the customer 10% discount. Find the marked price.

8. A dealer, through his agent, sold 12,000 bu. of wheat at $1.44 a bushel. He invested the proceeds in flour at $9.50 a barrel. (a) If the agent charged $2\frac{1}{2}$% for selling the wheat and 2% for buying the flour, how many barrels did he buy, and (b) what amount did he have left to remit to his principal?

Assignment 61

1. A dealer bought 1,612,800 lb. of coal for $7.80 per long ton, delivered and sold it for $11.25 per short ton, delivered. The cost of delivering the coal which he sold was $1.80 per ton. How much did he make?

2. A town's budget of expenses for the coming year contains the following items: interest on bonds, $9800; salaries, $14,400; street improvements, $15,900; schools, $20,600; state and county tax, $12,389; contingent fund, $2000, and sinking fund, $6000. The assessed valuation of taxable property is $3,648,400. Find the tax rate.

3. A watering trough is 12 ft. long, $2\frac{1}{2}$ ft. wide, and 10 in. deep. (a) Approximately how many gallons of water will it hold? (b) How long will it take to fill it at the rate of $1\frac{1}{2}$ gallons a minute?

4. A speculator purchased 500 shares of stock at $82\frac{1}{4}$; brokerage, $20 per 100 shares. The semiannual dividend was $2\frac{3}{4}$%. (a) What was his annual income from this stock? (b) What rate per cent of interest did it yield on the money invested?

5. A merchant insured his store building, valued at $40,000, for $25,000. The building was damaged by fire to the extent of $14,000. The policy con-

tained the 80% co-insurance clause, and the premium was 30¢ per $100. (a) How much did the owner lose? (b) How much did the insurance company lose?

6. Find the cost in U. S. money of an invoice of goods purchased in England for £180, 7s., on which the freight prepaid to U. S. was £4, 3s., if exchange is $4.875.

7. A merchant sold an article for $12, less 10% discount. He made a profit on the selling price of $33\frac{1}{3}\%$. He bought the article at a discount of 20%. What was the original list purchase price?

8. A township 6 miles square has 36 sections of land containing 640 acres each. A roadway runs along the 4 sides of each section. How many miles of road are there in the township and on the lines between this township and the 4 adjacent townships? (Note: By drawing a diagram, this problem can be simplified.)

Assignment 62

1. Find the cost of the following bill of lumber:

140 pc.	Yellow Pine	$2'' \times 4'' \times 16'$	@	$54 per M.
80 "	Spruce	$2'' \times 6'' \times 18'$	@	55 " M.
112 "	Hemlock	$3'' \times 8'' \times 16'$	@	44 " M.
60 "	"	$4'' \times 4'' \times 12'$	@	45 " M.

2. Find the cost of digging a ditch 400 ft. long, 3 ft. deep, and 2 ft. wide, at $2.25 per cubic yard for earth, and $5.50 per cubic yard for rock, $\frac{1}{6}$ being rock.

3. The owner of a house, valued at $18,000, rents it for $150 per month. His expenses for taxes are $420, and for repairs, $280. If he allows 2% of the value of the house for depreciation, what rate of interest does the investment yield?

4. A corporation failed in business with assets amounting to $166,608 and liabilities amounting to $231,400. (a) How much can it pay on a dollar? (b) How much will a creditor receive whose claim is $18,310?

5. The net proceeds of a 60-day note, discounted at 6% on the day it was given, were $1758.60. (a) Find the face of this note. (b) Find the gross amount of the invoice the proceeds of this note would pay, if the discounts on the invoice were 20% and 10%.

6. A creamery received from its commission merchant $1309.50 as the net proceeds of a consignment of 2500 lb. of butter. If the agent charged 3% commission, for how much a pound was the butter sold?

7. A man sold 200 shares of 7% preferred B. & A. R. R. stock for $112\frac{1}{2}$ and invested the proceeds, after paying $25 per 100 shares brokerage, in a real estate mortgage at 6% interest. Did he increase or decreaase his income, and how much?

8. Property purchased in 1921 for $43,500 was sold in 1929 for $72,500. (a) What was the per cent of increase in value in the 8 years? (b) What was the average annual increase? (c) If the expenses were $797.50 a year, what was the average per cent of increase annually over the cost?

Assignment 63

1. A merchant bought 3000 lb. of tea at 30¢ a pound. He estimated that there would be a shrinkage of 1% in weighing it out to customers. By selling the tea at a certain price, he made 45.2% profit on the cost. Find the selling price per pound.

2. The census of a certain city over a period of 25 years was as follows:

1900	42,800
1905	54,100
1910	63,250
1915	73,450
1920	78,810
1925	81,460

Prepare a bar graph showing the increase for each period of five years.

3. A commission merchant received $280 for selling wheat on a commission of 2%. The wheat was sold for $1.60 per bushel, and the charges for freight were $284.70. (a) How many bushels of wheat did he sell? (b) How much were the net proceeds?

4. Find the bank discount and the net proceeds of a 6-months' note for $1250, dated June 6, at 6% interest, discounted June 29 at 6%.

5. A retailer marked certain goods to make a profit of 50%. During a special sale he discounted the marked price 25%, and his sales amounted to $1878.10. What was his gross profit from this sale?

6. A hardware merchant whose sales for one year amounted to $36,600 had marked his goods to make a profit of $66\frac{2}{3}$%. The next year he reduced all of his prices to make a profit of only 30%, and his sales increased to $74,100. How much did he gain or lose for the year by reducing his prices?

7. The cost of coal to heat an apartment house is $2360, and the services to care for the heating plant cost $1300 a season. An automatic oil heater is installed at a cost of $3875, and the oil for the next season costs $3140. Allowing interest at 6% on the cost of the oil heater and $120 a season for service for the heater, which is the more economical, and how much?

8. A New York importer bought 2500 yd. of English broadcloth at 7s., 6d. a yard. It weighed 980 lb. net, and the freight charges were £9, 10s., 6d. The ad valorem duty was 45% and the specific duty was 30¢ a pound. (a) What was the total cost? (b) At what price per yard, U. S. money, must the cloth be sold to gain 25% on the gross cost, when exchange is $4.875?

GENERAL PROBLEMS

1. How much money should be invested in U. S. $4\frac{1}{2}\%$ bonds at $105\frac{1}{2}$ to produce an annual income of \$1800?

2. A merchant owes \$1740, which he cannot pay for about 4 months. For how much should he draw his note for 4 months without interest so that, when it is discounted at a bank at 6%, it will just cancel the debt?

3. A merchant is offered goods invoiced at \$1460 list price, less 10%, 10%, and 5%, with 30 days' credit or 25% discount for cash. If he has to discount his note for 30 days at 6% in order to accept the cash offer, which is the better offer, and how much better?

4. The freight charges on 12,800 pounds for 270 miles were \$38.40 At the same rate, what would be the freight on 24,800 pounds for 360 miles?

5. A receiver realized \$103,782.32 from the sale of the assets of an insolvent corporation. The total liabilities were \$142,812.60, and the expenses of settling were \$8811.94. (a) How much can he pay on a dollar? (b) How much will a creditor receive whose claim is \$15,400?

6. Find the cost, at \$15.50 per M., of the brick required to build a wall 6 ft. high and 1 ft. thick around a lot 18 rods long and 12 rods wide. The wall is built on the inside of the lot lines, and 22 bricks are required for each cubic foot of wall.

7. The Fireman's Insurance Company insured goods amounting to \$248,800 at $2\frac{3}{4}\%$, and reinsured $\frac{3}{4}$ of the amount in the Hartford Fire Insurance Company at $2\frac{1}{2}\%$. The goods were totally destroyed by fire. How much was the net loss of each company?

8. On January 8, a customer sent his broker \$5000 and requested him to buy 200 shares of a certain stock quoted at $96\frac{1}{4}$. He ordered the broker to sell on February 7. The stock was sold for $102\frac{1}{2}$. How much did the customer gain, if the brokerage is \$20 per 100 shares for buying and \$25 per 100 shares for selling and 6% interest is charged by the broker on the money advanced? (The Federal tax on stock sold is 2¢ a share.)

9. A certain company's net earnings for the year are \$122,688. The amount of common stock is \$1,200,000 and of preferred stock, \$600,000. The directors declared a dividend of 8% on the preferred stock and set aside \$8,500 for the sinking fund. (a) What rate of dividend, to the nearest $\frac{1}{2}$ per cent can be paid on the common stock? (b) How much will be left in undivided profits?

10. At what price should shoes costing \$4.50 a pair be marked so as to allow 10% discount for cash and make a profit of 40%?

11. On January 6, a dealer bought \$4380 worth of goods on 90 days' credit. If money is worth 6%, how much should he pay when he settles this bill, on January 21?

12. *A* holds a note for \$1540, dated June 4 and payable December 4, 1929, with interest at 6%. What amount would he have received, if he had had this note discounted at the bank at 6% on the date of issue?

13. A house valued at \$15,000 was insured for $\frac{4}{5}$ of its value, at 50¢ per \$100, for three years; and the furniture, valued at \$3000, for $\frac{2}{3}$ of its value at the same rate. The house is totally destroyed and furniture valued at \$2200 is lost. (a) How much did the company have to pay in each case? (b) What was their loss, if they had collected premiums on this property for 12 years?

14. A man invested \$4925 in municipal $5\frac{1}{2}\%$ bonds at $98\frac{1}{2}$. After receiving his interest for the year, he sold them for $102\frac{3}{4}$. (a) How much did he gain? (b) What rate per cent of return did this investment pay him?

15. (a) How many board feet of lumber will be required for a stable floor 60 ft. long and 18 ft. wide, to be laid with planks 2″ thick and 10″ wide? (b) How much will the lumber cost at \$48 per M.?

16. *A* invested \$8000, and *B* \$12,000, in a partnership. Interest is to be allowed on the investments at 6%, after which gains and losses are to be shared equally. During the year the partners' gross gain was \$12,840, and their losses amounted to \$3410. Find (a) the net gain; (b) the present worth of the firm; and (c) each partner's present worth?

17. A man paid \$26.25 for a chair. The retailer sold it to him at 40% profit; the jobber sold it to the retailer at 25% profit, and the manufacturer sold it to the jobber at 25% profit. How much more than the manufacturer's cost did the consumer pay?

18. A speculator sold a house at 25% profit and with the proceeds bought another house, which he sold at 20% profit. He realized a total profit of \$7800. How much did he pay for each house?

19. An agent rendered an account purchase for tobacco amounting to \$1057.10, which included \$6.50 for packing and carting, and 3% commission. How many pounds did he buy at 68¢ a pound?

20. A dealer bought a piano, for which he paid \$450 cash. After holding it in stock for 6 months, he sold it and received in payment a 9-months' note dated May 6, 19—, for \$600. He discounted the note at a bank at 6% on the day he received it. How much did he gain, if money is worth 6%?

21. A merchant retiring from business invested his money as follows: \$12,315 in 5% bonds at $102\frac{1}{2}$, \$15,975 in $5\frac{1}{2}\%$ bonds at $106\frac{3}{8}$, and \$22,525 in 6% bonds at $112\frac{1}{2}$; the brokerage in each case being $\frac{1}{8}\%$. Find (a) his annual income, and (b) the rate of interest on his investments.

22. A man received \$1680 as an annual dividend of 7% on stock which he owned. Later he sold 100 shares at $124\frac{1}{2}$ and the remainder at $128\frac{3}{4}$. If he had to pay a brokerage charge of \$25 per 100 shares, what were the net proceeds of each sale?

23. A Boston importer owes a London firm £1506, 5s.; a Berlin firm, 2240 marks; and a Paris dealer, 5920 francs. Find the amounts, at the current rate of exchange, to be remitted in payment of these accounts. (At the time this was written the rates were \$4.8665 for the £; $\$0.0391\frac{3}{4}$ for the franc; and \$0.238 for the mark.)

24. A business block is 1500 ft. square. Find the cost, at 60¢ per square foot, of laying a cement walk 5 ft. wide around the outside of this block.

25. A builder tried to sell a house at a profit of 25%, but in order to make a sale, he finally accepted 10% less than his asking price. His gain was $1875. (a) How much did the house cost him? (b) At what price did he sell it?

26. A retired farmer rented his farm for $2000 a year. His expenses for taxes, repairs, and replacements were $560. If his net rental was 6% of the value of the farm, what was the value of the farm?

27. A 6% interest-bearing 90-day note for $2850, dated June 18, was discounted at a bank on July 9 at 6%. Find the proceeds.

28. Which is the better offer: an automobile at $2250, less 20% and 10%, or the same car at the same price, less 15% and 15%?

29. What sum must be invested in Denver 5% bonds at $107\frac{1}{4}$ to realize an annual income of $2500?

30. On November 1, a dealer deposited with his broker $1000 as a margin and ordered him to buy 10,000 bu. of corn at $84\frac{1}{2}$¢ a bushel. On December 15, he ordered the corn to be sold at $96\frac{1}{4}$¢ a bushel. The broker charged $\frac{1}{4}$¢ a bushel for both buying and selling, and 6% interest on the money advanced. How much did the dealer make? (The broker advanced, or loaned, to the dealer the difference between the margin and cost of the corn.)

31. A merchant sold 40% of his stock at a profit of 30%, and 80% of the remainder at a profit of 25%. If the unsold stock was inventoried at $1860, what was his total profit?

32. A merchant purchases in London 2400 yd. of carpet, $\frac{3}{4}$ of a yard wide, at 10s., 6d. a yard. The specific duty was 90¢ a square yard, and the ad valorem, 40%. How much did the carpet cost per yard, if the freight was $36? (£1 = $4.8665)

33. A commission merchant received $84 for selling grain at $1.40 a bushel on a commission of 3%. (a) How many bushels did he sell? (b) How much were the net proceeds, if the other charges were $114.80?

34. A note for $1800, dated July 10, 1928, payable on demand, with interest at 6%, was paid in part as follows: October 10, 1928, $500, and February 10, 1929, $800. How much was due on May 10, 1929?

35. A hall 80 ft. long, 60 ft. wide, and 18 ft. high has 8 windows, each $4' \times 8'$, and 2 doors, each $4' \times 7'$. Find the cost of painting the walls and ceiling at 85¢ per square yard, allowance being made for $\frac{1}{2}$ of all openings.

36. A man gave a second mortgage on his house for $2500 at 6% interest. The mortgage was dated January 2, 1927. On July 2, 1927, he paid $500 and the interest to date; on January 2, 1928, he paid $1000 and the interest on the balance to date; on January 2, 1929, he paid the balance and the interest to date. How much interest did he pay on this mortgage?

37. A three-piece suite of furniture was marked to sell at a profit of $66\frac{2}{3}\%$; it was finally sold for \$540 at a profit of $33\frac{1}{3}\%$. What rate per cent of discount on the marked price did the purchaser receive?

38. Overcoats costing \$24 each were sold at \$36 each, and the sales averaged 12 coats a day. If the selling price is lowered to \$32.50 and the sales average 20 coats a day, what is the per cent of increase or decrease in the daily profits?

39. On April 1, a man borrowed \$20,000 at 6% interest and with it bought a piece of property. On July 6, he sold the property for \$24,500 and paid his loan in full. If the other expenses in the purchase of this property amounted to \$240, how much did he gain?

40. The Dick Company makes a machine at a cost of \$82.50. It costs \$67.50 to market this machine. If the machine is sold for \$250, the profit is what per cent of (a) the selling price, and (b) of the gross cost?

41. An agent receives \$5000 from his principal with instructions to buy flour. He bought the flour at \$9.75 a barrel. The charges were as follows: 2% commission; 35¢ per 100 pounds for freight, and 20¢ a barrel for cartage. (a) How many barrels did he buy? (b) How much money had he left over? (A barrel of flour, barrel and all, weighs approximately 200 pounds.)

42. On June 12 a merchant bought \$2350 worth of goods, less $12\frac{1}{2}\%$ and 4%, on the following terms: 3/10, n/30. On June 22 he borrowed the money on his 20-day 6% interest-bearing note and took advantage of the 3% discount on the invoice. How much did he gain by so doing? (Find the amount of the note at maturity.)

43. Machinery that cost \$128,000 is inventoried at the end of 10 years at \$96,000. What is the average per cent of annual depreciation on the cost of this machinery?

44. Mr. Martin bought a house and lot for \$12,500, paying \$5000 cash and giving a mortgage at 6% interest for the remainder. He rented the house for \$125 a month. If the taxes amounted to \$325, and he allowed 4% of the price which he paid for the house for depreciation and upkeep annually, what rate per cent of return did he receive on his actual investment?

45. A manufacturer bought raw material amounting to \$88,400. His buying expenses amounted to \$1105. (a) How much should be added to the cost of an article, the factory cost of which is \$88.97, to cover its proportionate share of the buying expenses? (b) At what price should this article be marked in order to make a profit of 25% on its total cost?

46. A man bought a factory building and grounds for \$235,000, and at the end of $2\frac{1}{2}$ years sold the whole property for \$275,000. During the time he held the property, he collected \$1000 a month rent; paid taxes amounting to \$7400, and spent \$3560 for repairs and minor improvements. If money is worth 6% interest, did he gain or lose, and how much?

47. In a certain town a tax of \$54,459.50 is levied for town, county, and state purposes. The property valuation on the assessment roll is \$2,562,800. (a) What is the tax rate? (b) What is the tax on property assessed at \$16,400?

48. To pave a state highway 40 ft. wide and 5 miles long, the excavating and leveling cost 90¢ per square yard, and the cement cost \$3.50 per square yard. How much did it cost to pave this highway?

49. A man who is insolvent owes you \$1240. If his total assets are \$26,400 and his liabilities are \$39,600, how much should you receive in settlement of your account?

50. Find the cost, at 12¢ per running foot, of fence material required to enclose a circular plot 240 feet in diameter.

51. On January 12, 1929, A. H. Moore gave O. D. Dix a 6-months' 6% interest-bearing note for \$3,412.80. Mr. Dix had this note discounted on January 26, 1929, at 6%. Find the net proceeds.

52. A dealer marked goods 60% above cost and then sold them at a discount of $12\frac{1}{2}$% on the marked price. What per cent did he gain (a) on the cost, and (b) on the selling price?

53. A dealer buys 428 yards of woolen cloth at \$2.70 a yard. If it is sponged before it is sold to the trade, and shrinks 4% as a result, at what price per yard must it be sold in order to gain $33\frac{1}{3}$% of the cost?

54. The catalogue price of an article was \$80, less 25% and $12\frac{1}{2}$%. The invoice price net of the article was \$47.25. What additional discount was allowed for cash?

55. Find the present worth of a note for \$4000 bearing interest at 5%, due in 8 months, if money is worth 6%.

56. A man willed \$50,000 to each of his three sons. The first son invested his money in 8% preferred stock at 125; the second son invested his in 4% bonds at 80; and the third son invested in real estate mortgages at 6%. At the end of three years what did each son's money amount to?

57. A dealer bought 8 carloads of coal, averaging 84,000 pounds to the car, for \$5.25 per long ton. He sold the coal at \$7.15 net per short ton. How much did he gain?

58. A dealer bought a radio for \$116, less 25% discount. He sold it for \$150, less 10%. What net per cent profit on the selling price did he make if the cost of doing business is $15\frac{5}{9}$% of the selling price?

59. An article cost \$96, less $12\frac{1}{2}$% discount. The buying expenses amounted to 5% of the net cost. If it cost $18\frac{1}{2}$% of sales to do business, what per cent on the gross cost would be made by selling the article for \$183.75, less 20%?

60. An article of furniture was sold for \$180, less $33\frac{1}{3}$%. It cost \$75, and the buying expenses were 6% of the net cost. If the cost of doing business was $23\frac{3}{4}$% of the sales, what per cent of the selling price was the net profit?

TESTS

TEST 1

To follow Assignment 1B

PART I

1. Add: (10)

1642	4261	1728	7926
7824	3429	2847	2927
9268	8264	6321	8429
7327	5962	9264	3728
4864	3847	2427	7264
3924	2925	1675	3176

2. Multiply: (10)

6743	8476	4879	3728
28	94	67	76

3. Find the cost of each of the following:

(5)	25 yd. @ 48¢	$	(5)	33 yd. @ 12¢	$
	64 yd. @ 50¢			70 yd. @ 14¢	
	75 yd. @ 67¢			92 yd. @ 8¢	
	80 yd. @ 15¢			34 yd. @ 21¢	
	44 yd. @ 11¢			52 yd. @ 9¢	
	Total	$		Total	$

PART II

4. A dealer bought a crate of oranges containing 20 doz. for $5.60. If he sold them for 45¢ per dozen, how much profit did he make?

5. A merchant bought 480 lb. of smoked meat, at 28¢ a pound, which he sold for 42¢ a pound; and 174 lb. of boiled ham, at 57¢ a pound, which he sold for 50¢ a pound. Did he gain or lose, and how much?

6. An egg dealer bought 5 crates of eggs, each crate containing 30 doz., for 40¢ a dozen. If he paid $3.00 express and sold the eggs for 52¢ a dozen, how much profit did he make?

7. Find the total cost of the following items: 420 yd., at $1.27 a yard; 312 yd., at $.75 a yard; 291 yd., at $1.86 a yard; and 537 yd., at 39¢ a yard.

8. In problem 7, the lot containing 420 yd. was sold at a profit of 20¢ a yard; the 312 yd., at a profit of 40¢ a yard; the 291 yd., at a profit of 33¢ a yard, and the 537 yd., at a profit of 11¢ a yard. What was the gross profit?

9. A man earned $7.50 a day, working an average of 23 days a month, for 9 months. His expenses were $112 a month from March 1 to December 1 (9 months). How much did he save?

10. A painter earned $105.60 by painting a house. If he received $1.10 an hour and worked 8 hours a day, how many days did it take him to paint the house?

TEST 2

To follow Assignment 2B

Part I

1. Add: (10)

36281	41426	43724	27462
27846	22340	59627	39346
39467	80726	32846	28307
28246	72528	73921	27261
34821	34372	28724	58924
76420	91564	59267	92376
28473	58621	28742	27841
92164	72564	93564	83462
78321	37826	73862	73921
84263	76518	37924	29287

2. Multiply: (10)

42827	37846	38597	87945
968	874	786	697

3. Find the cost of the following: (10)

(a)

587 lb. @		9¢	per pound	$
1600 " "		$2.25	" "	
195 " "		33¢	" "	
480 " "		16¢	" "	
2300 " "		7¢	" "	
			Total	$

(b)

310 yd. @	67¢	a yard	$
219 " "	43¢	a yard	
4367 " "	8¢	a yard	
1746 " "	14¢	a yard	
174 " "	87¢	a yard	
		Total	$

Part II

4. A young man earned \$23 a week. He paid \$6.50 each week for board, \$3.25 for room rent, 95¢ for carfare, 75¢ for laundry, and \$1.10 for incidentals. After paying these expenses each week and \$140 for clothes during the year, how much did he save in one year?

5. A cotton dealer bought 20,000 lb. of cotton in Jacksonville, for 17¢ a pound. He paid freight to New York, \$380; cartage, \$85; storage, \$260, and insurance, \$75. For how much per pound must he sell the cotton in order to gain \$1200?

6. A merchant sent goods to his three branch stores. To the first store he sent \$784.27 worth; to the second store he sent \$127.30 worth less than to the first, and to the third store he sent \$28.70 worth more than to both the first and the second. How much did he send to all three stores?

7. A clerk earned \$18 a week during the first year; \$22 a week the second year; \$25 a week the third year; and \$27 a week the fourth year. If his expenses average \$16.60 a week, how much did he save in the four years?

8. (a) What is the average weight of 8 bales of cotton weighing respectively 627 lb., 698 lb., 812 lb., 758 lb., 771 lb., 694 lb., 760 lb., and 676 lb. (b) Find the cost at 28¢ a pound.

9. A grain dealer bought 6780 bu. of wheat at \$1.94 a bushel. He kept the wheat 5 months, during which time the shrinkage was 124 bu. He sold the wheat for \$2.27 a bushel. Did he gain or lose, and how much?

10. A customer bought 1 doz. handkerchiefs at 35¢ each, $\frac{1}{2}$ doz. towels at 47¢ each, $\frac{3}{4}$ doz. washcloths at 12¢ each, $\frac{1}{2}$ doz. collars at 21¢ each, and $\frac{1}{4}$ doz. neckties at 65¢ each. He gave in payment a \$20 bill. How much change should he receive?

TEST 3

To follow Assignment 3B

Part I

1. Add: (10)

142962	12.64	96.20	8.45
167	128.76	172.45	9.28
3928	3.84	5.86	7.62
72	192.87	.74	3.17
376	5762.77	312.50	4.25
9264	729.44	92.64	12.12
28776	34.29	7.37	11.64
927842	147.80	18.60	3.74
17641	28.00	378.00	21.12
928	3762.43	58.92	24.92

2. (a) **Divide:** (5)

312)8764.08 647)2990434

(b) **Multiply:** (5)

26492 396493
5873 37428

3. Find the cost of the following: (10)

368 bu.	@	92¢	a bushel	$
1241 "	"	37¢	" "	
72 "	"	$2.18	" "	
584 "	"	1.62	" "	
193 "	"	68¢	" "	
			Total	$

37 bbl.	@	$6.78	a barrel	$
158 "	"	5.16	" "	
23 "	"	2.97	" "	
452 "	"	3.74	" "	
96 "	"	7.29	" "	
			Total	$

Part II

4. A town paid $20,000 for a site for its town hall, and $122,592 for the building. The population of the town was 8912. Find the per capita cost of the town hall.

5. A city employs 22 school medical inspectors at salaries of $100 per month for ten months each year. How much does this medical inspection cost per pupil, if there are 27,500 pupils attending the schools?

6. In a certain county the tax on small automobiles averaged $8.50; and on large automobiles, $17. There were 24,961 automobiles in the county, of which 11,364 were small cars. How much tax was collected?

7. A man bought a house for $12,500. The expenses in connection with the purchase were: searching title, $80; attorney's fee, $25. He repaired the house at a cost of $1580, and then sold it through an agent for $17,000. The agent charged $850 for making the sale. Other expenses in connection with the sale were $10. How much was made on the house?

8. A fruit dealer bought 10 crates of oranges, 18 doz. to the crate, at $4.60 a crate; 8 crates, 16 doz. to the crate, at $5.20 a crate; and 6 crates, 12 doz. to the crate, at $5.40 a crate. The freight on the lot was $7.58. The average price at which he sold them was 45¢ a doz. Did he gain or lose, and how much?

9. Find the total cost of 3720 lb. of wheat, at \$1.80 per bushel of 60 lb.; 7056 lb. of corn, at 85¢ per bushel of 56 lb.; 5376 lb. of barley, at 76¢ per bushel of 48 lb.; and 8352 lb. of oats, at 39¢ per bushel of 32 lb.

10. A man traded 1800 acres of wild land, at \$8.75 per acre, for an improved farm at \$150 per acre. How many acres should there be in the improved farm to make the exchange equal?

TEST 4

To follow Assignment 4B

Part I

1. Find the value of $6\frac{1}{4}$ lb. plus $3\frac{3}{4}$ lb. plus $7\frac{1}{8}$ lb. plus $9\frac{3}{8}$ lb. plus $4\frac{1}{2}$ lb. plus $8\frac{5}{8}$ lb. plus $12\frac{7}{8}$ lb. plus $11\frac{3}{8}$ lb., at $7\frac{1}{4}$¢ per pound. (10)

2. Make the extensions for the following items: (10)

112	doz.	@	$62\frac{1}{2}$¢	per dozen	\$
96	"	@	$83\frac{1}{3}$¢	per dozen	
72	"	@	\$1.12$\frac{1}{2}$	per dozen	
88	"	@	$37\frac{1}{2}$¢	per dozen	
$66\frac{2}{3}$	"	@	\$75	per dozen	
				Total	\$ _____

3. Perform the operations indicated: (10)

$\frac{7}{8}$	$\times \frac{1}{3}$
$6\frac{3}{5}$	$+ 19\frac{4}{5}$
$29\frac{3}{4}$	$- 3\frac{3}{8}$
79.392	$\times$ 100
37	$\div$ 1000

Part II

4. A man spends $\frac{1}{6}$ of his income for rent, $\frac{1}{6}$ for food, and $\frac{1}{3}$ for other expenses. What part of his income does he save?

5. One man can do a piece of work in 6 days. Another man can do the same piece of work in 4 days. How long will it take them, working together, to do the piece of work?

6. A farmer's land is so divided that $\frac{1}{8}$ of it is woodland, $\frac{1}{4}$ of it is pasture land, $\frac{1}{6}$ of it is covered by water, $\frac{1}{24}$ is unfit for use, and the remaining 160 acres are tillable land. How many acres are there in the farm?

7. The land and buildings on the land are worth \$8400. The buildings are worth $\frac{3}{5}$ as much as the land. How much is the land worth?

8. A house and lot cost \$12,850. The house costs 4 times as much as the lot. How much did each cost?

9. A man left his estate to his three children. The eldest received $\frac{4}{11}$, the next $\frac{7}{22}$, and the youngest $22,400. How much was the estate valued at?

10. A merchant bought 912 yd. of cloth. He sold $\frac{1}{4}$ of it for $37\frac{1}{2}¢$ a yard and the remainder at $39\frac{1}{4}¢$ a yard. How much did he receive for all of the cloth?

TEST 5

To follow Assignment 5B

Part I

1. Find the cost of: (10)

26 yd.	@	25¢	per yard	$
42 "	@	$12\frac{1}{2}¢$	" "	
72 "	@	75¢	" "	
48 "	@	$16\frac{2}{3}¢$	" "	
96 "	@	$37\frac{1}{2}¢$	" "	
			Total	$

2. Find the cost of: (10)

48 lb.	@	$62\frac{1}{2}¢$	per pound	$
56 "	@	$37\frac{1}{2}¢$	" "	
64 "	@	$87\frac{1}{2}¢$	" "	
88 "	@	$12\frac{1}{2}¢$	" "	
72 "	@	$16\frac{2}{3}¢$	" "	
			Total	$

3. Find the cost of: (10)

64 yd.	@	$6\frac{1}{4}¢$	per yard	$
80 "	@	$31\frac{1}{4}¢$	" "	
148 "	@	$37\frac{1}{2}¢$	" "	
96 "	@	$56\frac{1}{4}¢$	" "	
58 "	@	$12\frac{1}{2}¢$	" "	
			Total	$

Part II

4. A grain dealer sold 5968 bu. of wheat. For $\frac{3}{8}$ of it he received $1.75 per bushel; for $\frac{1}{2}$ of the remainder he received $1.67 per bushel; and for the remainder he received $1.63 per bushel. Find (a) the total selling price, and (b) the average price per bushel.

5. A lady paid \$563.10 for her traveling outfit to go abroad. She found that she had spent only $\frac{3}{16}$ of her money. The cost of her outfit was only $\frac{3}{8}$ of the cost of the trip. (a) How much money had she? (b) What was the cost of the trip?

6. From a bin containing 128,000 lb. of coal, $13\frac{1}{2}$ tons were sold at one time, and $17\frac{1}{2}$ tons at another time. (a) What fractional part of the coal remained unsold? (b) What is the value of the coal remaining unsold at \$12.80 a ton? (2000 lb. in one ton.)

7. Change in a cash register is $\frac{1}{2}$ in half dollars, $\frac{1}{4}$ in quarters, $\frac{1}{8}$ in dimes, $\frac{1}{16}$ in nickels, and the remainder in pennies. (a) What part of the change is in pennies? If the cash register contained \$32.00 in change, (b) how much is in quarters?

8. Two men bought a piece of real estate, paying for it \$12,500. One paid \$6000, and the other, \$6500. The property was sold for \$17,250. (a) How much should each receive in proportion to his investment? (b) The profit is what fractional part of the purchase price?

9. A dealer bought $60\frac{1}{2}$ cords of wood at \$8.20 per cord. He sold $\frac{1}{2}$ of it at \$9.60 per cord and the remainder for \$302.50. (a) How much did he gain or lose? (b) How much per cord did he receive for the wood in the second sale?

10. A ranchman had $\frac{2}{5}$ of his sheep in one pasture, $\frac{4}{9}$ in another pasture, and the remainder, 140 in number, in a third pasture. How many sheep did he own?

TEST 6

To follow Assignment 6B

Part I

1. (a) **Add:** (5)

\$ 578.42
5.76
93.42
278.47
2496.28
378.49
9.27
87.62
374.81
3976.43

(b) **Multiply:** (5)

37924
81376

(c) **Divide:** (5)

7693)8393063(

(d) **Subtract:** (5)

8796497
5849729

2. Find the cost of the following: (5)

$87\frac{1}{2}$ yd.	@	$2.40 a yard	$
$34\frac{4}{9}$ "	"	.90 " "	
$16\frac{2}{3}$ "	"	.84 " "	
$62\frac{1}{2}$ "	"	.88 " "	
$6\frac{1}{4}$ "	"	.48 " "	
Total			$
Less $\frac{1}{8}$ ($12\frac{1}{2}$ %)			

3. Find the cost of the following: (5)

$166\frac{2}{3}$ lb.	@	$ .15 a pound	$
$43\frac{3}{4}$ "	"	.64 " "	
$87\frac{1}{2}$ "	"	1.84 " "	
$33\frac{1}{3}$ "	"	1.08 " "	
$93\frac{3}{4}$ "	"	2.40 " "	
Total			$
Less $\frac{1}{3}$ ($33\frac{1}{3}$ %)			

Part II

4. A merchant bought a quantity of cloth for $540. By selling it at $2.40 a yard, he gained $\frac{1}{3}$ of the cost. How many yards were there?

5. A purchasing agent charged $\frac{1}{6}$ of the net cost of goods as his fee for buying them. If his fee was $1968, what was the total cost of the goods he bought?

6. A contractor in excavating for a cellar, removed 848 cu. yd. of rock and earth. If $\frac{3}{8}$ was rock and cost $3.75 per cu. yd. to remove, and the earth cost $1.25 per cubic yard to remove, what was the cost of digging the cellar?

7. A man bought a ring, a watch, and a chain for $242. He found that the ring cost $\frac{1}{6}$ the cost of the chain, and the watch $2\frac{1}{2}$ times as much as the chain. How much did each cost?

8. The sales in one month in the shoe department of a store were $12,800. In the clothing department the sales were $2\frac{1}{8}$ times as much as in the shoe department; in the furniture department, $1\frac{1}{8}$ times as much as in the shoe department; and in the dress goods department, $1\frac{1}{64}$ times as much as in the shoe department. (a) Find the amount of sales in each department. (b) Find the total sales for the month.

9. From a bolt of cloth containing $48\frac{7}{8}$ yd., the following pieces were cut: $3\frac{3}{4}$ yd.; $5\frac{1}{4}$ yd.; $7\frac{3}{8}$ yd., and $9\frac{5}{6}$ yd. (a) How much cloth is left in the bolt? (b) How much is the remaining cloth worth at $87\frac{1}{2}¢$ a yard?

10. Solve:

$$15\tfrac{5}{6} + 19\tfrac{3}{8} - 4\tfrac{7}{12} \times 9\tfrac{2}{3} + 7\tfrac{3}{8}.$$

TEST 7

To follow Assignment 7B

Part I

1. (a) **Find the sum of:** (5)

$$\tfrac{3}{8} + \tfrac{4}{9} + \tfrac{7}{12} + \tfrac{5}{18} + \tfrac{1}{4}$$

(b) **Multiply:** (5)

$$28\tfrac{5}{6} \times 12\tfrac{2}{3}$$

2. (a) **Solve:** (5)

$$3\tfrac{7}{8} + 5\tfrac{1}{6} \times 23\tfrac{2}{3}$$

(b) **Solve:** (5)

$$\tfrac{4}{9} + \tfrac{7}{12} \times \tfrac{5}{6} \div \tfrac{3}{8}$$

3. Find the total cost of: (10)

153 yd. of silk	@ $33\frac{1}{3}¢$ a yard	$
390 yd. of plaids	@ $16\frac{2}{3}¢$ a yard	
192 yd. of linen	@ $93\frac{3}{4}¢$ a yard	
608 yd. of gingham	@ $37\frac{1}{2}¢$ a yard	
1152 yd. of lining	@ $6\frac{1}{4}¢$ a yard	
Less $\frac{1}{5}$ (20 %)		$

Part II

4. Find the cost of the following 12 pieces of Windsor Prints at $8\frac{1}{3}¢$ per yard:

$24^2, 26^1, 34^3, 29^2, 36^1, 28^3, 32^2, 31^3, 24^1, 27^3, 33^1, 30^3$

5. Find the net cost of the following bill of hardware:

8 doz. handsaws	@ $26.50 per dozen
7 " carpet beaters	@ $3.50 per dozen
14 " garden rakes	@ $7.75 per dozen
8 kegs wire nails, 8d., 800 lb.,	@ $4\frac{3}{4}¢$ a pound
4 doz. P. #4 hammers	@ $11.25 per dozen

6. Find the total cost of 38 bags of rice, each containing $12\frac{1}{2}$ lb., at $11\frac{1}{2}¢$ a pound; 275 grapefruits at $9.75 per hundred; 91 qt. of cranberries at $7\frac{3}{4}¢$ a quart; 27 bbl. of flour at $10.60 a barrel; 24 crates of eggs, 30 doz. in each crate, at 37¢ a dozen.

7. A hotel, having 1284 guests during a week, consumed the following: meat, 7290 lb., average price $43\frac{1}{2}¢$ per pound; canned vegetables, 3122 cans, average price $19\frac{1}{4}¢$ per can; butter, 1614 lb., average price $51\frac{1}{3}¢$ per pound; vegetables, bread and other foods cost $2361. Find (a) the total cost, (b) the cost per guest.

8. By selling an automobile for \$1200, the seller lost $\frac{1}{5}$ of what he paid for it. (a) How much did he pay for the automobile? (b) How much did he lose?

9. The total cost of building a piece of road was \$145,000. The labor cost \$85,000; equipment, \$27,500; and material, \$32,500. What fractional part of the total cost is each item of cost?

10. A man spent \$126.40, which was $\frac{1}{8}$ of all the money he had. How much money remained?

TEST 8

To follow Assignment 8B

Part I

1. (a) **Divide:** (5)

$$33 \times 57 \times 96 \times 108 \text{ by } 38 \times 11 \times 16 \times 27 \times 8$$

(b) **Divide:** (5)

$$120 \times 61 \times 43 \times 21 \text{ by } 360 \times 86 \times 16 \times 21$$

2. Perform the indicated operations: (10)

$$\begin{aligned} 96.287 &\times 3.764 = \\ 84 &\div 1230 = \\ 29.647 &\div 31.42 = \\ 567.843 &\times 81.33\tfrac{1}{3} = \\ 221.3728 &\div 3.54 = \end{aligned}$$

3. Find the result of: (10)

$$\begin{aligned} 87.519 &\times 100 = \\ .0007 &\div 10 = \\ .0842 &\div 1000 = \\ 3.7428 &\times 33\tfrac{1}{3} = \\ 9.5 &\div 100 = \end{aligned}$$

Part II

4. If 28 men can build a wall in 70 days, working 8 hours a day, how many days will it take 14 men, working only 7 hours a day, to do the same work? (Solve by cancellation.)

5. A farmer exchanged 10 loads of wheat, each weighing 2580 lb., worth \$1.80 a bushel of 60 pounds, for 16 loads of phosphate, each load containing 14 bags of 240 lb. each. What was the price of the phosphate per 100 pounds? (Solve by cancellation.)

6. A man has .4 of his money invested in mortgages; .25 invested in bonds; .22 invested in real estate, and the remainder in the bank. (a) If he has $2600 in the bank, how much is he worth? (b) How much has he invested in each of the items mentioned?

7. In a certain company, Foster contributed $5500 to the capital; Murray contributed $6500; Harper contributed $8700; and Logan contributed $9300. What decimal part of the capital did each contribute? (Carry results to two decimal places, retain fractions, and prove your work.)

8. Harris and Moore join in the purchase of a piece of real estate. Harris paid .6 of the purchase price, and Moore the remainder. The property was sold at a profit of $6600. Harris received $13,200 for his proportionate share. How much did they pay for the real estate? (Prove your work.)

9. The total cost of operating a business for one year was $12,210. The expenses were distributed as follows: light, heat, and power, 7.42%; supplies for use, 16.342%; office help, 11.28%, and salaries, 34.276%. The remainder was charged to overhead expenses. Find the amount of each item of expense, correct to four decimal places.

10. In a certain city the population is 184,967. During the year there were 2166 deaths and 2748 births. (a) Find, to the nearest tenth, the decimal number of deaths per thousand inhabitants. (b) Find, to the nearest tenth, the decimal number of births per thousand inhabitants.

TEST 9

To follow Assignment 9B

Part I

(Note: Tables may be referred to)

1. (a) **Add:** (5)

140 rd., 3 yd., 2 ft., 7 in.
27 rd., 4 yd., 1 ft., 9 in.
92 rd., 5 yd., 2 ft., 11 in.

Total

(b) **Add:** (5)

36 sq. rd., 9 sq. yd., 4 sq. ft., 44 sq. in.
49 sq. rd., 25 sq. yd., 6 sq. ft., 63 sq. in.
56 sq. rd., 33 sq. yd., 3 sq. ft., 72 sq. in.

Total

2. (a) **Multiply:** (5)

7 gal., 3 qt., 1 pt., 2 gi. by 32

(b) **Multiply:** (5)

7 oz., 5 dr., 2 sc., 17 gr. by 40

3. (a) Reduce 3 lb., 5 oz., 12 pwt., 17 gr. to grains (5)
(b) Reduce 7 bu., 3 pk., 5 qt., 1 pt. to pints (5)

Part II

4. In going to certain places by automobile, a party traveled 11 hr., 26 min. the first day; 9 hr., 37 min., the second day; and 12 hr., 29 min., the third day. How long did it take them to make the trip?

5. A milk dealer sold to one customer 4 gal., 3 qt., 1 pt.; to another customer, 7 gal., 2 qt.; to a third customer, 5 gal., 1 qt., 1 pt. How much profit did he make, if he paid 9¢ a quart for the milk and sold it for 14¢ a quart?

6. A man owns four parcels of land measuring respectively:

17 A., 34 sq. rd., 12 sq. yd., 8 sq. ft.
29 A., 48 sq. rd., 6 sq. ft.
37 A., 56 sq. rd., 24 sq. yd., 4 sq. ft.
23 A., 35 sq. rd., 18 sq. yd., 2 sq. ft.

How much land is there in the four parcels?

7. A farm contains 124 A., 96 sq. rd., of which 47 A., 36 sq. rd. are under cultivation, 39 A., 9 sq. rd. are woodland, and the remainder is pasture. Find the area of the pasture.

8. (a) How many feet of fence wire will be required to build a fence around a farm 168 rd., 4 yd. long and 130 rd., 2 yd. wide? (b) What will the wire cost at 68¢ per hundred feet?

9. A gardener raised 340 bu. of potatoes from 8 bu., 2 pk. of seed. How much did one bushel of seed yield?

10. A manufacturer of silverware made 30 gross of silver spoons, each spoon weighing 12 pwt., 18 gr. How much did the silver cost at $2.11 per ounce?

TEST 10

To follow Assignment 10B

Part I

(Note: Tables may be referred to)

1. Reduce to higher denominations: (10)

(a) 8456 in.
(b) 2844 gi.
(c) 30652 gr., apothecaries' weight.
(d) 22298 pwt.

2. Find the cost of: (10)

15 lb., 9 oz.	pork	at 32¢ per pound	$
12 lb., 6 oz.	steak	at 44¢ per pound	
3 gal., 2 qt., 1 pt.	vinegar	at 40¢ per gal.	
5 lb., 7 oz.	cheese	at 32¢ per pound	
		Total	$_____

3. Reduce to the lowest denomination: (10)

5 rd.,	3 yd.,	2 ft., 7 in.
7 gal.,	2 qt.,	1 pt., 3 gill.
9 cu. yd.,	12 cu. ft.,	540 cu. in.
4 lb.,	7 oz.,	2 dr.

Part II

4. (a) How many containers holding 1 gal., 2 qt. each can be filled from two barrels containing 42 gal. each? (b) If each container is sold for $1.60, how much cash is received?

5. A merchant bought 5 kegs of molasses, each containing 8 gal., 2 qt., at 86¢ per gallon. How much did it cost him?

6. Find the total cost, at 90¢ per ounce, of:

3 lb., 5 oz., 7 dr., 1 sc., 10 gr.;
4 dr., 2 sc., 5 gr.;
2 lb., 8 oz., 1 sc., 5 gr.;
10 oz., 2 sc., 10 gr.;
1 lb., 6 oz., 5 dr.

7. A dealer bought 12 carloads of coal, each carload weighing on an average 42,560 pounds, at $8.70 per long ton, and sold it at $10.75 per short ton. How much did he gain by the transaction?

8. How many grains of pure gold will be required to make one gross of 18-karat gold pins, each weighing 3 pwt., 12 gr.? (18-karat means $\frac{18}{24}$ pure gold.)

9. Find the sum of:

7 Km., 6 Hm., 4m., 8 dm.;
6 Km., 7 Hm., 5 Dm.; 8m.,
9 Km., 9 Dm., 8m., 7dm.

10. Add:

3 gal., 3 qt., 1 pt., 3 gi.;
12 gal., 2 qt., 1 pt., 3 gi.;
15 gal., 2 qt., 2 gi.;
9 gal., 3 qt., 3 gi.

TEST 11

To follow Assignment 11B

Part I

(Note: Tables may be referred to)

1. Add: (10)

6 rd., 3 yd., 2 ft., 6 in.
10 rd., 2 yd., 1 ft., 7 in.
8 rd., 4 yd., 0 ft., 9 in.

2. (a) Reduce £1250, 12s., 6d. to dollars. (5)
(b) Reduce 2560 francs to dollars. (5)

3. (a) Reduce $1840 to marks. (5)
(b) Reduce $2400 to English money. (5)

Part II

4. Reduce 2 pk., 5 qt. to the decimal of a bushel.

5. What fractional part of a day (24 hr.) is 6 hr., 30 min.?

6. If it takes 60 men, working 8 hr. a day, 20 days to complete a piece of work, how long will it take 45 men to complete the same piece of work?

7. A man bought two building lots for $7500. If $\frac{7}{8}$ of the cost of one lot was equal to the cost of the other, how much did he pay for each lot?

8. What is the difference in yards, feet, and inches between 784 m. and 802 yds?

9. An automobile party motored 2120 Km. in France and 2712 miles in the United States in one season. How many miles did they motor?

10. A merchant finds that he can buy a certain article in England for 36s. In France he can buy the same article for 230 francs. Find in United States money, the difference in the cost of 50 dozen of these articles bought in each country.

TEST 12

To follow Assignment 12B

Part I

1. What number, multiplied by itself, will produce (a) 81? (b) 196? (c) 324? (d) 625? (10)

2. Find the square root of (a) 104,976; (b) 183,184. (10)

3. (a) Find the perimeter and the area of a plot 85 ft. by 125 ft.; (b) of a plot 14 rd. by 28 yd. (10)

Part II

4. Find the weight of 2 barrels of water. (Refer to table on p. 74.)

5. A merchant bought silk at 84¢ per meter and sold it at $1.12 per yard. How much did he gain on 1240 m.? (1 meter is equal to 1.0936 yards.)

6. Find the cost, at 56¢ per square foot, of building a sidewalk 4 ft. wide on the outside of two sides of a corner lot 60 ft. by 120 ft.

7. Find the cost, at $6.75 per rod, of building a fence around a square field containing 7396 sq. rd.

8. Find the cost of painting the four walls of a room 15 ft. long, 12 ft., 6 in. wide, and 8 ft., 6 in. high, at 90¢ per square yard.

9. (a) How many acres are there in a tract of land 280 rd. long and 160 rd. wide? (b) How much will it cost to plow this land at $3.50 per acre?

10. The base of a right triangle is 24 ft. and the altitude is 32 ft. What is the area?

TEST 13

To follow Assignment 13B

Part I

1. (a) Find the result of $127 \times 127 \times 127$. (b) What is the result called? (5)

(c) Find the fourth power of $\frac{7}{12}$. (5)

2. (a) Divide 8452 by 2113, by the process of subtraction. (5)

(b) Solve: $\sqrt{2985.984}$. (Carry decimal to three places.) (5)

3. (a) Divide 9,726,240 by 231. (Carry decimal to two places.) (5)
(b) Multiply 953.76 by 1209. (5)

Part II

4. The sides of a triangle measure 24 ft., 32 ft., and 36 ft., respectively. Find the area.

5. What will it cost, at 45¢ per square yard, to paint a barn that is 80 ft. long, 40 ft. wide, and 18 ft. high to the rafters, and of which the two gable ends are 10 ft. to the ridge?

6. A house is 60 ft. long, 32 ft. wide, and 20 ft. high. The gables are 32 ft. wide and 8 ft. to the ridge. How much will it cost, at 45¢ per square yard, to paint this house?

7. Find the cost, at $5.40 per square yard, of a sidewalk around a city block 250 ft. by 500 ft. The walk is 4 ft. wide and is built on the outside of the lot line.

8. How much will it cost, at $1.75 per square yard, to plaster the walls and ceiling of a room 24 ft. long, 18 ft. wide, and 9 ft. high, if $\frac{1}{6}$ of the wall space is allowed for openings?

9. Find the cost of material for 50 doz. six-sided paper cartons $18'' \times 24'' \times 30''$, at 4¢ per square yard.

10. Find the cost, at 48¢ per square foot, of a piece of pavement in the form of a trapezoid, the parallel sides being 108 ft. and 90 ft., and the distance between these sides being 60 ft.

TEST 14

To follow Assignment 14B

Part I

1. The base of a right-angled triangle is 22 ft. and the altitude is 15 ft. Find (a) the hypotenuse; (b) the area. (10)

2. The hypotenuse of a right-angled triangle is 25 rd., and the altitude is 11 rd. Find (a) the base; (b) the area. (10)

3. Find the circumferences of two circles having diameters, respectively, of (a) 18 ft. and (b) 115 rd. (10)

4. Find the area of two circles one (a) 12 ft. in diameter, and the other (b) 27 in. in diameter. (10)

Part II

5. A tank is 18 ft. long, 4 ft. 6 in. wide, and 3 ft. deep, inside measurements. (a) How many cu. ft. of water will it hold? (b) How many

minutes will it take to fill the tank at the rate of 10 gal. per minute? ($7\frac{1}{2}$ gal. = 1 cu. ft.)

6. (a) How many square feet of sheet iron will be required to make a pipe 2 ft. in diameter and 15 ft. long, allowing 1 in. for the seam. (b) What will it cost at 13¢ per sq. ft.?

7. What will it cost to paint the surface of an oil tank 6 ft. in diameter and 28 ft. long, at 22¢ per square yard?

8. (a) How many square feet of lumber will be required to build a six-sided box 5 ft. long, 4 ft. wide, and 3 ft. high? (b) What will the lumber cost at $6\frac{1}{2}$¢ per square foot?

9. A wheel is 30 in. in diameter. How many yards will it travel in making 40 complete revolutions?

10. The excavation for a cellar was equal to 360 cu. yd. It was 10 yd. wide and 2 yd. deep. (a) How long was the cellar? (b) How many cubic yards of stone will it take to build a wall for this cellar 18 in. thick and $7\frac{1}{2}$ ft. high, allowing $\frac{1}{5}$ for mortar?

TEST 15

To follow Assignment 15B

PART I

1. Solve: (10)

89268 − 54375
118743 − 89462
7849 − 3492
124872 − 96784

Total =

Proof:

2. Find the total value of the following: (10)

312 lb. @ 5¢ per pound $
178 lb. @ 4¢ " "
225 lb. @ 6¢ " "
415 lb. @ 7¢ " "

Total $

3. Find the cost of the following: (10)

2985 lb. @ $1.60 per hundredweight $
4490 lb. @ 2.70 per hundredweight
3640 lb. @ 2.87½ per hundredweight
5860 lb. @ 12.50 per hundredweight

Total $

Part II

4. A room 15 ft. long, 12 ft. wide, and $8\frac{1}{4}$ ft. high, has 2 windows each 3 ft. by $5\frac{1}{2}$ ft. and one door $3\frac{1}{2}$ ft. by 7 ft. Find the cost of plastering the walls and ceiling at \$1.80 per square yard. Make full allowance for the openings.

5. (a) How many yards of carpet 27 in. wide will be required for a room 18 ft., 6 in. long and 15 ft., 9 in. wide? (b) What will the carpet cost at \$2.75 per running yard? (The strips run lengthwise of the room.)

6. (a) How many rolls of paper will be required, and (b) what will be the cost, at \$2.40 per double roll; to paper a room 22 ft. long, 16 ft. wide, and $8\frac{1}{2}$ ft. high? Allow for 3 windows $3\frac{1}{2}$ ft. wide and one door 4 ft. wide. (In estimating for papering, the width of openings is deducted from the perimeter.)

7. Find (a) the number of board feet and (b) the total cost of:

30 pieces $4'' \times 4''$, 16′ long, @ \$48 per M.
60 pieces $2'' \times 4''$, 14′ long, @ 44 per M.
100 pieces $1'' \times 10''$, 12′ long, @ 45 per M.
75 pieces $2'' \times 6''$, 18′ long, @ 42 per M.

8. (a) How many cords are there in a pile of wood 120 ft. long, 2 ft. wide, and 4 ft. high? (b) What is it worth at \$8.25 per cord.

9. (a) Find how many bushels of wheat are in a car 35 ft. long and 7 ft. wide, filled to a depth of $4\frac{1}{2}$ ft.? (b) What is the wheat worth at \$1.80 per bushel? (2150.42 cu. in. in a bushel of grain or approximately $\frac{4}{5}$ of a bushel in one cu. ft.)

10. (a) Find the number of gallons of water which a cistern 12 ft. long, 10 ft. wide, and 9 ft. deep will hold. (b) How long will it take to empty the cistern at the rate of 14 gal. per minute?

TEST 16

To follow Assignment 16B

Part I

1. Add as indicated: (10)

\$472.60	+ \$387.40	+ \$950.25	= \$
862.50	+ 528.70	+ 275.80	=
475.75	+ 287.50	+ 312.90	=
295.65	+ 815.55	+ 472.45	=
	+	+	= \$

Proof:

2. Solve as indicated: (10)

$$415 \div \tfrac{5}{8}$$
$$468 \div 66\tfrac{2}{3}$$
$$75 \times \tfrac{7}{9}$$
$$11\tfrac{1}{8} - 3\tfrac{5}{16}$$
$$\tfrac{1}{6} + \tfrac{1}{9} + \tfrac{2}{27}$$

3. (a) Find the circumference of a circle having a diameter of 36 ft. (5) (b) Find the diameter of a circle having a circumference of 120 yd. (5)

Part II

4. Find the cost of a pile of wood 38 meters long, 1.75 meters wide, and 1.5 meters high, at 144 francs a stere (cubic meter). (A franc is equal to $\$0.0391\tfrac{3}{4}$.)

5. How much will it cost, at \$2.25 a yard, to carpet a room 20 ft. long and 18 ft. wide, with carpet 27 in. wide, if $3\tfrac{1}{2}$ yd. are allowed for waste in matching the pattern, and the strips run lengthwise of the room?

6. A tank filled with oil measures 10 m. long; 6 m., 5 dm. wide, and 4 m., 5 dm. deep. (a) What is the value of the oil at 3 francs a liter? (b) How much is it worth in U. S. money? (Exchange at par, 1 franc = $3.91\tfrac{3}{4}$¢.)

7. A section of ice 150 ft. long and 40 ft. wide is cut from a pond covered with ice 8 in. thick. What is the ice worth at \$2.50 per ton? (A cu. ft. of ice weighs $57\tfrac{1}{2}$ lb.)

8. Find the cost, at \$12.50 per M., of brick required to build a wall 7 ft. high, 12 in. thick, and 12 rd. long, allowing $\tfrac{1}{6}$ for mortar. (A standard brick measures $2'' \times 4'' \times 8''$.)

9. Find the cost of shingles, at \$4.80 per M., required to cover the roof of a barn 80 ft. long and 24 ft. from eaves to ridge on each side. The shingles are 4 in. wide, and laid 6 in. to the weather.

10. Find the cost of the following lumber:

20 pc. 12′ long, 10″ wide, and 2″ thick, at \$46.50 per M.
24 pc. 16′ long, 6″ wide, and 4″ thick, at \$56.00 per M.
32 pc. 18′ long, 8″ wide, and 1″ thick, at \$44.00 per M

TEST 17

To follow Assignment 17B

Part I

1. How many articles will (10)

\$48 buy	@ $33\frac{1}{3}¢$	each	?
\$24 "	@ $12\frac{1}{2}¢$	"	?
\$21 "	@ $14\frac{2}{7}¢$	"	?
\$30 "	@ 25¢	"	?
\$36 "	@ $16\frac{2}{3}¢$	"	?
		Total	_____

2. Find the cost of the following: (10)

7	articles	at	\$18	per	doz.	\$
16	"	"	15	"	"	
30	"	"	22	"	"	
15	"	"	24	"	"	
28	"	"	30	"	"	
					Total	\$_____

3. Find the cost of the following: (10)

21 qt.	at	11¢	a pint
16 eggs	"	60¢	a doz.
7 qt.	"	\$1.60	a gal.
12 oranges	"	8 for	25¢
5 lb. spinach	"	3 lb. for	25¢

Total \$_____

Part II

4. A dealer bought 980 long tons of coal, at \$8.40 per long ton, and sold it at \$11.50 per short ton. What was his gain, if 14¢ per 100 lb. was paid for freight, and \$342 for hauling?

5. A room 24′, 8″ × 15′, 6″ is floored with 4″ quartered oak flooring, costing \$160 per M. square feet. Find the cost of the floor, reckoning labor and nails at \$36.75. Allow $\frac{1}{5}$ for waste in matching. (Find the number of board feet to the nearest ten feet.)

6. (a) A circular grass plot is 100 ft. in diameter. How many square yards are there in its area? (b) What part of an acre is this plot? (Find the nearest even number of square yards.)

7. A rectangular tank is 4.6 m. deep, 5 m. wide, and 8.5 m. long. How much time will be required to fill this tank at the rate of 150 liters per minute?

8. At $4.40 a square yard, what will it cost to build a cement walk, 8 ft. wide, on the outside of a city square 300 ft. square?

9. In a certain section the rainfall during April was 3 in. How many gallons of water fell on a watershed the area of which is 100 square miles? (1 sq. mi. = 4,014,489,600 sq. in.)

10. A circular tank is 16 ft. in diameter and 40 ft. high. How many gallons will it hold? (Express your answer in whole gallons. Approximately $7\frac{1}{2}$ gal. are equal to 1 cu. ft.)

TEST 18

To follow Assignment 18B

Part I

1. Find the gain on each item and the total gain: (10)

Sold for	*Cost*	*Gain*
$28700	$22140	$
18960	13728	
8492	5862	
37348	31589	
92177	71768	
	Total	$

Proof:

2. Find the selling price: (10)

48,240 lb. wheat	@ $1.80 per bushel	$
37,860 lb. potatoes	@ $2.10 " "	
26,928 lb. barley	@ 94¢ " "	
27,104 lb. oats	@ 67¢ " "	
21,952 lb. shelled corn	@ 89¢ " "	
	Total	$

3. Find the total cost: (10)

25,840 lb. hay	@ $18 per ton	$
16,560 lb. feed	@ $22 per ton	
12,880 lb. straw	@ $14 per ton	
6746 lb. meal	@ $26 per ton	
	Total	$

4. Solve: (10)

(a) $297\frac{5}{16} \times 72\frac{2}{9} =$

(b) $1565 \div 305\frac{5}{9} =$

Part II

5. A tract of 204 acres of land was purchased for $1600 per acre. The promoters took $\frac{1}{4}$ of the land for streets and sidewalks, and 4680 sq. ft. for an entrance, and divided the remaining portion into building lots 50 ft. by 100 ft. They paid $157,000 for improvements and sold the lots for $450 each. How much did they make?

6. A grain bin is 10 ft., 6 in. long; 8 ft., 3 in. wide, and 6 ft., 4 in. deep, inside measurements. How many bushels of grain will it hold? (1 bu. contains 2150.4 cu. in.)

7. Find the total cost of the following bill of lumber:

123 pc. hemlock	2″ × 4″ × 16′	@ $40 per M.
96 pc. hemlock	2″ × 6″ × 14′	@ $42 per M.
110 pc. spruce	2″ × 10″ × 12′	@ $48 per M.
1500 ft. 2″ strips		@ 2¢ per foot
17,000 shingles		@ $6.75 per M.

8. Find the cost, at 48¢ per square yard, of plastering the walls and ceiling of a room 22 ft., 6 in. long; 18 ft., 6 in. wide, and 9 ft. high, allowing $\frac{1}{6}$ of the surface of the walls for doors and windows.

9. How many yards of carpet, 36 in. wide, will be required to cover the floor of a room 24 ft. long and 15 ft. wide, if the strips run the long way and 12 in. are allowed on each strip for matching?

10. A room 20 ft. long, 15 ft. wide, and 8 ft. high above the baseboard has 2 doors each 3 ft. by 7 ft., and 3 windows each 3 ft. by 5 ft. What will it cost to paper the walls, at $1.80 per double roll? (A double roll of American-made paper is 48 ft. long and 18 in. wide. In estimating papering, the width of the openings is deducted from the perimeter of the room.)

TEST 19

To follow Assignment 19B

Part I

1. Find the amount due each workman and the total of the following time sheet: (10)

Name	*Time in Hours*						*Total Hours*	*Rate per Hour*	*Wages Due*
	M.	*T.*	*W.*	*Th.*	*F.*	*S.*			
L. P. King	8	7	4	8	6½	3½	.....	$ .85	$
O. D. House	7½	6½	8	8	7	4	.....	.80	
E. H. Porter	8	8	6½	7½	8	3	.....	.95	
O. M. Small	7	7	8	7	7½	4	.....	1.10	
D. H. Laning	8	6½	7	6½	8	2½	.....	.85	
F. A. Hanson	6½	8	7½	8	6½	4	.....	.95	
S. T. Frank	5½	7½	8	7½	8	3	.....	.75	
R. T. Camp	7	5½	8	7	5½	4	.....	.70	
							Total		$

2. Find the freight charges on the following: (10)

10 cases of groceries,	650 lb.	@ 87¢	per cwt.	$
128 bbl. flour,	196 lb. each	@ 27½¢	per cwt.	
325 rolls wrapping paper,	1300 lb.	@ 48¢	per cwt.	
27 crates of eggs,	62 lb. each	@ 77¢	per cwt.	
21 crates of vegetables,	750 lb.	@ 56½¢	per cwt.	
			Total	$

3. (a) The base of a triangle is 28 ft. and the altitude is 16 ft. Find the area. (5)

4. The hypotenuse of a right-angled triangle is 20 ft. and the altitude is 12 ft. Find the base. (5)

Part II

5. A section of land (640 A.) is divided into four rectangular farms, and each farm is fenced. (a) Draw a diagram and show how many rods of fence will be required to enclose each farm. (b) How much will the fence cost at $2.80 per rod?

6. A pile of 4-foot wood is 80 ft. long. (a) How high is the pile, if it contains 15 cords? (b) What is it worth at $13.75 a cord?

7. From a farm 160 rd. by 96 rd., 28 acres were sold for $1820. (a) At that rate, what is the whole farm worth? (b) What fractional part of the farm was sold?

8. A plot contains 48 sq. rd. and 8 sq. yd. (a) What part of an acre is the plot? (b) What is it worth at $4400 per acre?

9. A garage operates on 54 hours a week regular time and allows time and a half for Sundays. (a) Find the wages of the following employees: Green, 49 hr. at 70¢ per hr; Benton, 36 hr. at 84¢ per hr,. and 7 hr. on Sunday; Howland, 52 hr. at 95¢ per hr., and 6 hr. on Sunday; and Moore, 47 hr. at 65¢ per hr. (b) Find the total pay roll.

10. At $56 per M. board feet, find the cost of the following:

72 joists	2″ × 8″ × 12′	
36 "	2″ × 10″ × 16′	
240 boards	1″ × 6″ × 14′	
180 scantlings	2″ × 4″ × 16′	
40 beams	6″ × 8″ × 18′	
Total		

TEST 20

To follow Assignment 20B

Part I

1. Recapitulate: (20)

Department	*Sales*						*Total for Week*
	M.	*T.*	*W.*	*Th.*	*F.*	*S.*	
Grocery	84.90	98.30	87.40	102.10	127.50	185.67	
Shoe	107.00	121.50	89.40	112.00	137.25	216.75	
Furniture	208.00	312.70	215.90	187.35	275.00	372.00	
Rugs & Carpets	212.00	172.80	287.00	375.40	188.90	295.00	
Clothing	175.00	290.00	285.00	317.60	298.70	462.20	
Suits & Coats	128.40	192.80	247.00	312.30	360.50	478.00	

2. (a) Find the volume of a cylinder 3 ft. in diameter and 6 ft. high. (5)

3. (a) Find the volume of a triangular prism 5 ft. on a side and 12 ft. high. (5)

Part II

4. A cylindrical tank, 10 ft. in diameter and 25 ft. deep, is filled with water. (a) How many cubic feet of water does it hold? (b) How many gallons does it hold? ($7\frac{1}{2}$ gal. = approximately 1 cu. ft.)

5. The volume of a prism is 480 cu. in. If it is 8 in. wide by 6 in. high, how long is it?

6. The diameter of a cylinder is 3 ft., and its volume is 56.5488 cu. ft. How long is it?

7. A cylinder has a radius of 4 ft., and its volume is 351.8592 cu. ft. How long is it?

8. How many square feet of sheet metal will be required for a cylindrical oil tank 4 ft. in diameter and 12 ft. long?

9. How much will it cost to paint the six outer surfaces of 21 boxes 4 ft. long, 3 ft. wide, and 3 ft. high, at 20¢ per square yard?

10. What is the volume of a cone, if its base is 5 ft. in diameter and its altitude is 9 ft.?

TEST 21

To follow Assignment 21B

PART I

1. Find the selling price of the following: (10)

Cost		*Gain*	*Selling Price*
$1240	add	25 %	$
320	"	7 %	
120	"	60 %	
480	"	33⅓ %	
75	"	40 %	
		Total	$_____

2. Find the net cost of the following items: (10)

56 lb. coffee at 37½¢	$
144 lb. sugar at 6¼¢	
184 lb. rice at 7⅛¢	
231 lb. butter at 63⅓¢	
Less 8%	$_____

3. Find the net cost of the following items: (10)

Cost price		*Discount*	*Net cost*
$1560	less	25 %	$
580	"	8 %	
912	"	16⅔ %	
728	"	14⅔ %	
		Total net cost	$_____

PART II

4. A dealer sold 1200 bu. of potatoes. For 80% of them he received $2.10 per bushel, and for the remainder he received $1.95 per bushel. How much did he receive for the 1200 bu?

5. A farmer sold 440 bbl. of apples for $2717. If he received $6.25 per barrel for 70% of the apples, how much per barrel did he receive for the remainder?

6. A debtor settled with his creditors by paying 85% of what he owed. He owed Harris $690, Jackson $1240, and Loomis $1160.40. How much did each creditor receive?

7. A dealer bought 4000 bu. of potatoes at $1.65 per bushel, and put them in storage. Five months later he sold them for $2.15 per bushel. He paid 4¢ per bushel storage, and found, when he removed them, that 3% had decayed. How much did he make?

8. A merchant paid several bills on which the following discounts were allowed: 5% on a bill for \$468; 8% on a bill for \$720.30; 3% on a bill for \$137.80; and 12½% on a bill for \$640. Find the total amount paid.

9. A man bought a used automobile for \$450. He spent 28% of the cost in making repairs, and then sold it for \$850. Did he gain or lose, and how much?

10. A young man's annual salary was \$1800. He spent 12½% for clothes; 37% for board; 6¼% for amusements; and 3½% for incidentals. (a) How much did he spend for each item? (b) How much did he save?

TEST 22

To follow Assignment 22B

PART I

1. Find the gross cost of the following items: (10)

Net Cost	*Discount*	*Gross Cost*
\$675	10%	\$
432	4%	
828	8%	
1164	3%	
	Total	\$_____

2. Find: (10)

35% of \$ 700.00
12% of \$ 880.00
15% of \$1670.00
22% of \$1260.00
28% of \$1131.00

3. Find the gross amount of the bill in each case: (10)

Discount	*Rate of Discount*	*Amount*
\$120.00	40%	\$
312.00	30%	
28.00	7%	
408.00	20%	
89.60	8%	
	Total	\$_____

PART II

4. D. W. Harris bought a house and lot for \$12,800 and sold it for \$16,000. What per cent did he gain on the cost?

5. School was in session 94 days the first term. One pupil was absent 18 days. What per cent of the time was he absent?

6. A real estate agent sold a house for $19,250. He charged $962.50 for selling the house. What per cent of commission did he charge?

7. A man's salary was $3600. He spent $720 for rent, $773 for food and clothes, and $451 for other expenses. What per cent of his salary did he save?

8. A merchant bought 400 bbl. of apples for $5.60 per barrel. He paid $160 to have them sorted and repacked. If he sold 380 bbl. of good apples from the lot for $7.60 per barrel, what per cent of profit did he make on the gross cost?

9. A business man owed one creditor $1068.75; another, $2282.75, and a third, $2896.50. The amount of his resources was $28,400. What per cent of his net capital did he owe these creditors?

10. A man paid $12,000 for a house and lot. During the year he paid $320 for taxes, $20 for insurance, and $140 for repairs. He rented the house for the year at $100 per month. What per cent of profit did he make on the investment?

TEST 23

To follow Assignment 23B

PART I

1. Find the net cost of each of the following items and the total: (10)

List Price		*Discount*	*Net Cost*
$1500	—	$12\frac{1}{2}\%$	$
960	—	$16\frac{2}{3}\%$	
1280	—	10% and 5%	
780	—	$33\frac{1}{3}\%$	
2400	—	$37\frac{1}{2}\%$	
		Total	$_____

2. Find the selling price per dozen and the amount of the following items, if a profit of 25% is made: (10)

Items	*Cost*	*Selling Price*	*Amount*
150 doz. @	16 ¢ per dozen	$	$
240 dox. @	48 ¢ per dozen		
160 doz. @	$37\frac{1}{2}$¢ per dozen		
168 doz. @	$1.12 per dozen		
		Total	$_____

3. Find the result of each of the following: (10)

$\frac{1}{4}\%$ of $ 24.80 $

$\frac{1}{8}\%$ of $240.00

$\frac{3}{4}\%$ of $960.00

125 % of $150.00

$137\frac{1}{2}\%$ of $480.00

Total $_____

Part II

4. A merchant sold some shopworn goods at $16\frac{2}{3}\%$ below cost, and as a result lost $31.60. (a) How much did the goods cost? (b) For how much did he sell the goods?

5. A man bought an apartment house, which he rented for $27,800 a year. After paying $8300 expenses for the year, he made $7\frac{1}{2}\%$ on his investment. How much did he pay for the apartment house?

6. A merchant sold 12,800 bbl. of potatoes for $5.50 per barrel. If his profit amounted to $14,080, what per cent of profit did he make on the cost of the potatoes?

7. Three men are engaged in business. One man invested $6000; another invested $8000, and the third invested $10,000. What per cent of the capital did each man invest? Prove your work.

8. A salesman, who received for his services 4% of his gross sales, earned $128.60 during January, $172.80 during February, and $192.40 during March. (a) How much were his sales for each month? (b) How much were his sales for the three months?

9. A fruit dealer sold a quantity of fruit for $27.45. His gain was equal to 22% of the cost. How much did he pay for the fruit?

10. A merchant sold 1200 yd. of cloth for $683.40, which was 15% less than he paid for it. How much per yard did the cloth cost him?

TEST 24

To follow Assignment 24B

Part I

1. Find the net cost: (10)

6 doz. #8 Knives and Forks	@	$12.80
3 doz. #17 Spoons	@	6.75
4 doz. #12 Carving Sets	@	68.25
2 doz. #9 Bread Knives	@	4.20

Less 10% and 5% discount

2. Find the net cost: (10)

12 kegs 8d Wire Nails	@	$ 4.35
3 doz. #3 H. S. Hammers	@	9.60
5 doz. #18 J. D. Screw Drivers	@	3.40
7 doz. #2 J. S. Planes	@	18.40

Less $12\frac{1}{2}\%$ and 2% discount

Part II

3. A merchant sold \$42,000 worth of merchandise the first year; \$56,000 worth the second year, and \$72,000 worth the third year. What was the per cent of increase in his sales (a) the second year over the first, and (b) the third year over the second?

4. A speculator invested \$45,000. The first year he made a profit of $8\frac{1}{5}\%$, which he added to his capital. The second year he lost $11\frac{1}{2}\%$. (a) What was his capital at the end of the second year? (b) What per cent of his original investment was his net loss?

5. A grocer made a profit of 15% on the cost of his goods during the first year. The second year he made a profit of 12%, and the third year he made a profit of 14%. The first year his profit was \$4500; the second year it was \$6360, and the third year it was \$8456; how much were his gross sales for the three years?

6. A miller bought 2000 bu. of wheat at \$1.92 a bushel. He paid \$312 freight, and \$52.80 to have the wheat unloaded at his mill. (a) What was the gross cost of the wheat? (b) What per cent of the net cost was the cost of the freight and the unloading?

7. A farmer bought 92 head of cattle for \$48 a head. He kept them for 7 months at a cost of \$6 each per month. He sold them at \$112 per head. What per cent of profit did he make on the gross cost?

8. A speculator bought a house and lot for \$12,000. He spent \$2690 for repairs, \$270 for taxes, and \$40 for insurance and water tax. He sold the house and lot through a real estate agent for \$18,500. The agent charged 5% for making the sale. (a) What was the speculator's net profit? (b) What per cent of profit did he make on the gross cost?

9. A man who earned \$3000 a year saved 25%. Each year he invested his savings at 6% annually. Find his income from his investment for the fifth year.

10. An automobile dealer sold 10% more cars the second year than he did the first year; 25% more the third year than the second, and 20% more the fourth year than the third. During the four years he sold 615 cars. How many did he sell the first year?

TEST 25

To follow Assignment 25B

Part I

1. Find the net cost of the following items: (10)

7 pc. Broadcloth $42\frac{1}{2}$, $37\frac{3}{4}$, $38\frac{1}{4}$, $41\frac{1}{2}$, $37\frac{3}{4}$, $39\frac{1}{2}$, $36\frac{1}{4}$	@	\$6.12
5 pc. Cheviot $39\frac{3}{4}$, $37\frac{1}{2}$, $42\frac{1}{4}$, $43\frac{3}{4}$, $38\frac{3}{4}$	@	4.80
4 pc. Serge $47\frac{1}{2}$, $45\frac{3}{4}$, $48\frac{1}{4}$, $49\frac{1}{2}$, $46\frac{3}{4}$	@	5.60

Less 10% and 3%

2. Find the net cost of the following items: (10)

6 pc. Taffeta $51\frac{1}{4}$, $50\frac{3}{4}$, $53\frac{1}{2}$, $54\frac{1}{4}$, $55\frac{3}{4}$, $49\frac{1}{4}$	@	$2.60
5 pc. Chiffon $38\frac{1}{4}$, $39\frac{1}{2}$, $37\frac{3}{4}$, $36\frac{1}{2}$, $35\frac{3}{4}$	@	2.15
7 pc. Silk Pongee $48\frac{1}{2}$, $39\frac{1}{4}$, $47\frac{3}{4}$, $49\frac{1}{2}$, $44\frac{1}{4}$, $46\frac{1}{2}$, $43\frac{1}{4}$	@	.88

Less 2% and 8%

3. Find the net cost of the following items: (10)

4 pc. Satin Crepe $57\frac{1}{4}$, $59\frac{1}{2}$, $54\frac{3}{4}$, $51\frac{1}{2}$, $53\frac{1}{4}$	@	$2.38
5 pc. Canton Crepe $47\frac{1}{2}$, $42\frac{1}{4}$, $43\frac{3}{4}$, $44\frac{1}{4}$, $48\frac{3}{4}$	@	1.57
3 pc. Satin Charmeuse $39\frac{1}{2}$, $37\frac{1}{4}$, $38\frac{3}{4}$	@	1.73

Less 2% and 10%

Part II

Find the net amount of the following invoices:

4. T. W. Harper bought from the Sanderson Hardware Company the following items:

$2\frac{1}{2}$ doz. Stove Shovels No. K-27	@	$1.48
$3\frac{1}{4}$ doz. Coal Hods No. H-99	@	7.32
$1\frac{1}{2}$ doz. Steel Oil Cans No. S-34	@	9.24
$1\frac{3}{4}$ doz. Enamel Water Pails No. E-41	@	15.00

Less $12\frac{1}{2}$%

5. G. W. Green bought the following from the Post Wire and Nail Company:

24 doz. pkg. Upholstering Nails No. K-98	@	$1.08
30 doz. pkg. Numeral Nails No. N-24	@	2.40
15 doz. pkg. Hooks and Eyes No. 2–8	@	1.40
12 doz. pkg. Screw Eyes Assorted	@	1.72

Less 8% and 2%

6. Find the net cost of:

$1\frac{1}{2}$ doz. Locks No. T. R. 19	@	$ 6.96
$2\frac{1}{3}$ doz. Night Latches No. N. L. 64	@	16.44
$3\frac{1}{4}$ doz. Rim Latch Sets No. R. L. S. 27	@	19.20
$\frac{3}{4}$ doz. Fulton Locks No. F 28	@	14.40

Less 5%

7. The Hobson Hardware Company sold to O. E. Tegan, less 8% 10 days, 5% 30 days:

24 doz. strap hinges No. S. H. 92	@	$7.38
15 doz. pkg. carriage bolts No. C. B. 1337	@	5.40
7 doz. pkg. $\frac{1}{4}''$ rivets No. W. B. 30	@	1.32
12 doz. pkg. steel rivets No. F. S. 17	@	1.44

Find the net cash cost.

8. A. S. Browning & Company, Albany, N. Y., bought of O. C. Hanson & Co., New York, N. Y., January 7, 19—, on account, 90 days; 2%, 30 days; 5%, 10 days:

$1\frac{1}{4}$ doz. F. S. Hammers No. 57	@	$18.00
$3\frac{1}{3}$ doz. Steel Cutters No. H. C. 72	@	22.50
$1\frac{1}{6}$ doz. Forged Tongs No. F. D. 63	@	5.52
$2\frac{3}{4}$ doz. Cutting Nippers No. C. S. 24	@	8.00

Make out the bill in correct form.

9. The V. Green Hardware Company of Atlanta, Ga., bought of D. W. Moore & Co., Newark, N. J. June 5, 19—, on account 60 days, 8% 10 days:

4 Vises No. R. A. 214	@	$3.70
7 Vises No. H. C. 312	@	2.90
8 Vises No. U. D. 171	@	1.75
10 Vises No. C. B. 68	@	3.15

Make out the bill correctly.

10. Find the net cost of the following, less 12% and 4%:

9 Shovels No. S. P. S. 214	@	$ .97
6 Shovels No. S. F. S. 116	@	1.12
15 Spades No. I. S. D. 48	@	.72
18 Forks No. M. F. 29	@	.84

TEST 26

To follow Assignment 26B

Part I

1. Find the cost of 7 loads of coal weighing, respectively, 2800 lb., 3700 lb., 3300 lb., 3400 lb., 2950 lb., 3840 lb., and 4100 lb., at $16.75 per ton of 2000 pounds. (10)

2. Find the cost of 4 loads of wheat weighing, respectively, 3600 lb., 4050 lb., 3160 lb., and 3280 lb., at $1.98 per bushel of 60 pounds. (10)

3. Find the cost of 6 loads of oats weighing, respectively, 2120 lb., 3410 lb., 2856 lb., 2940 lb., 2630 lb., and 2780 lb., at 78¢ per bushel of 32 lb. (10)

Part II

Find the net amount of the following invoices:

4. Sold to H. A. Marks, 127 Broadway, Albany, New York; terms 4%, 30 days; n/60:

4 doz. Dinner Plates P. G. 21	@	$14.60
$3\frac{1}{2}$ doz. Bread and Butter Plates B. B. 24	@	9.80
$3\frac{3}{4}$ doz. Tea Saucers T. S. 60	@	5.40
$3\frac{3}{4}$ doz. Teacups H. T. 70	@	7.45

5. Sold to Harrison & Moore, 28 Grove Street, Salem, Mass.; terms 4%, 10 days; n/30:

124 pc. F. Cypress 1″ × 3″ × 16′	@	$72.50 per M.
170 pc. F. Cypress 1″ × 6″ × 14′	@	68.75 " "
260 pc. F. Cypress 1″ × 12″ × 12′	@	78.00 " "
125 pc. M. Cypress 1″ × 8″ × 18′	@	90.00 " "

6. Sold to D. E. Kingsley, Chicago, Ill.; terms 5%, 10 days; n/60; F. O. B. Mine—Long tons:

96,400 lb. Stove Coal	@	$6.20 per ton
122,080 lb. Egg Coal	@	4.85 " "
84,560 lb. Chestnut Coal	@	5.15 " "
70,000 lb. Pea Coal	@	3.90 " "

7. Sold to L. M. Kechner & Co., Buffalo, N. Y.; terms 3%, 10 days; n/90:

6 cars No. 1. Wheat 240,280 lb	@	$1.80 per bushel
4 cars No. 2. Wheat 156,240 lb	@	1.74 " "
3 cars Oats, 25,680 lb	@	.62 " "
1 car Buckwheat 38,400 lb	@	.97 " "

(Wheat, 60 lb. per bu.; oats, 32 lb. per bu., and buckwheat, 48 lb. per bu.)

8. Sold to J. C. Hinse & Co., San Francisco, Cal.; terms 5%, 10 days; 2%, 30 days; n/90:

$2\frac{1}{4}$ doz. Padlocks G. C. 27	@	$3.45
$3\frac{1}{3}$ doz. Padlocks G. S. 34	@	2.28
$1\frac{1}{4}$ doz. Pulleys F. P. 290	@	5.80
12 kegs Nails #8	@	4.90

9. Sold to Stern Bros., Boston, Mass.; terms 6%, 10 days; n/90 days:

10 pc. Cashmere 51, $49\frac{1}{2}$, $48\frac{3}{4}$, 47, $46\frac{1}{4}$, $49\frac{1}{2}$, $45\frac{3}{4}$, 46, $48\frac{3}{4}$, $47\frac{1}{2}$	@	$1.52\frac{1}{2}$
6 pc. Velveteen 41, $43\frac{1}{2}$, $44\frac{3}{4}$, $41\frac{1}{4}$, 48, $46\frac{3}{4}$	@	$.72\frac{3}{4}$

10. Sold to L. W. Olsen & Company, St. Louis, Mo.; terms 4%, 10 days; n/90:

15 Bed Springs M. T. 42	@	$11.60
20 Mattresses C. F. 67	@	18.40
24 Pillows G. F. #2H	@	2.25
36 Mattress Covers #37	@	2.80

TEST 27

To follow Assignment 27B

Part I

1. Find the net price of the following: (10)

Market Price	*Discounts*	*Net Price*
$4.80	5%, 8%	$
16.20	3%, 5%	
12.85	2%, 25%	
11.70	20%, 10%, 5%	
	Total	$_____

2. Find the list price of the following: (10)

Net Price	*Discounts*	*List Price*
$14.40	20 %, 10%	$
124.69	25 %, 5%	
18.74	8 %, 3%	
111.60	33⅓%, 10%	
	Total	$_____

Part II

3. A furniture dealer bought an invoice of furniture amounting to $2960, less 12½%, 8% and 2%. What was the net cost?

4. Chairs are priced $15 each. If you buy them at that price, less 33⅓% and 12½%, and sell them for the same list price less 20%, how much profit would you make on 12 chairs?

5. A dealer bought plumbing supplies at 40% and 15% less than the list price, and sold them at the same list price less 10% and 5%. Find his profit on supplies listed at $2500.

6. The discount on an invoice of shoes was $413, and the discounts were 10% and 2%. What was the net amount of the invoice?

7. A merchant marked down goods, as follows: suits, were $35, now $28; overcoats, were $28, now $21; shirts, were $2.25, now $1.50. What is the per cent of discount in each case?

8. A merchant bought bathtubs for $2600. He paid $128 freight and the discount was $12\frac{1}{2}\%$. At what per cent profit on the net cost must he sell them to make $801?

9. A bill of goods was invoiced at $1230, less $33\frac{1}{3}\%$ and 10%. The freight and cartage were $34.60. Find (a) the gain, and (b) the selling price, if the goods were sold at a profit of 38% on the gross cost.

10. A merchant bought tables at $50 each, less 20% and 5%, and sold them at $75 each, less 20% and 5%. (a) How much did he make on 15 tables? (b) What per cent of profit did he make on the net cost?

TEST 28

To follow Assignment 28B

PART I

1. Find the selling price of each of the following: (10)

Cost	*Rate of Gain*	*Selling Price*
$18	25 %	$
36	$33\frac{1}{3}\%$	
42	$12\frac{1}{2}\%$	
65	38 %	
84	$16\frac{2}{3}\%$	

2. Find the selling price of each of the following: (10)

Cost of Dozen	*Rate of Gain*	*Selling Price Each*
$24	35 %	$
72	40 %	
150	28 %	
180	22 %	
360	$33\frac{1}{3}\%$	

3. Find the selling price of each of the following: (10)

List Price	*Discount, Net Cost*	*Rate of Gain*	*Selling Price*
$36	20 %	25 %	$
116	$12\frac{1}{2}\%$	35 %	
140	8 %	40 %	
720	10% and 2%	$37\frac{1}{2}\%$	
240	$16\frac{2}{3}\%$	35 %	

PART II

4. A dealer bought day beds for $48.50 each, less 8%. He paid $2.38 freight and cartage on each bed. For how much must he sell each bed to make a profit of 50% on the gross cost?

5. A merchant paid \$8 per yard for carpet, less $12\frac{1}{2}\%$ and 4%. He marked the carpet to be sold at a profit of $66\frac{2}{3}\%$ on the net cost. What was the marked price per yard?

6. A manufacturer sold an article to a jobber for \$84, less $33\frac{1}{3}\%$ discount. The jobber sold it to a retailer for \$96, less 25% discount. The retailer sold it to a customer at a profit of 40% on the net cost. How much did each party pay for the article?

7. A dealer offered an article for sale for \$112. At this price his profit would have been 40%. He finally accepted \$10 less. What per cent of profit did he make on the cost?

8. A merchant paid \$336 for an article, after discounts of $16\frac{2}{3}\%$ and 4% had been allowed. How much did he receive for the article, if he sold it at a profit of $12\frac{1}{2}\%$ on the original list price?

9. A merchant paid \$6.12 for an article, after discounts of 20% and 10% had been taken. He paid 38 cents freight, and sold the articles at a profit of 40% on the gross cost. (a) For how much did he sell each article? (b) What was the list price of each?

10. A dealer paid \$72 per dozen, less 10%, for chairs. The freight was \$1.20 per dozen, and he sold the chairs at a profit of 30% on the gross cost. For how much did he sell each chair?

TEST 29

To follow Assignment 29B

PART I

1. Find the cost of: (10)

248	articles	at	\$ .12½	\$
356	"	"	16.40	
48	"	"	.06¼	
120	"	"	2.50	
75	"	"	.27	
			Total	\$

2. Find the selling price of each of the following and the total gain: (10)

Cost	*Gain*	*Selling Price*	*Gain*
\$160	$37\frac{1}{2}\%$	\$	\$
45	8 %		
12	75 %		
63	$33\frac{1}{3}\%$		
110	$7\frac{1}{2}\%$		
	Totals	\$	\$

3. How many articles will: (10)

$76	buy at	25¢	each, less	20	%
112	" "	64¢	" "	$12\frac{1}{2}$	%
207	" "	75¢	" "	8	%
9	" "	36¢	" "	$16\frac{2}{3}$	%

Total _____

4. Find each of the following: (10)

1% of $147.50
$8\frac{1}{3}\%$ of $732
$2\frac{1}{2}\%$ of $160
$37\frac{1}{2}\%$ of $240
$83\frac{1}{3}\%$ of $330

Total _____

Part II

5. A manufacturer sold tables to a dealer for $36 each, less 40%. At what price should the dealer mark them, in order to sell them at 20% discount, and still make a profit of 50%?

6. A manufacturer sold shoes, to a dealer, at $60 per dozen pairs, less 10%. The dealer marked the shoes to sell at $7.50 per pair. What per cent of profit did the dealer make on the cost, if he allowed 10% discount?

7. A hardware merchant bought a stove for $84, less a discount of 10%. At what price must he mark the stove so that he may allow a discount of 20% from his asking price and still make a profit of 40%?

8. A dealer sold a chair listed at $48, at a discount of $12\frac{1}{2}\%$. By so doing he made a profit of 50% of the cost. (a) How much did he pay for the chair? (b) What was the list price, if the discount to him was 20%?

9. A manufacturer sold an article to a wholesaler at 20% profit; the wholesaler sold it to a retailer at 25% profit; and the retailer sold it to a consumer for $50.40, at 40% profit. How much did the manufacturer receive for the article?

10. The cost of manufacturing an automobile is as follows: material, $246.50; labor, $312.70; overhead, $96.80. At what price must the automobile be sold to realize a profit of 25%, and allow 20% for advertising expenses?

TEST 30

To follow Assignment 30B

Part I

1. Find the cost of buying the following: (10)

Purchase Price	*Cost of Buying in Per Cent*	*Cost of Buying*
\$28,840	$3\frac{1}{2}\%$	\$
33,412	$2\frac{3}{4}\%$	
74,656	$1\frac{1}{8}\%$	
18,920	$4\frac{1}{5}\%$	
	Totals	\$

2. What per cent of sales is the cost of doing business in each of the following: (10)

Amount of Sales	*Cost of Doing Business*	*Per Cent of Sales*
\$37,950	\$3225.75	
52,640	5922.00	
129,800	19,145.50	
243,400	54,765.00	

3. Find the per cent of net profit on the selling price in the following: (10)

Selling Price	*Profit*	*C. D. B.*	*Per Cent of Net Profit*
\$ 88.00	\$26.40	21 %	
124.00	41.50	24 %	
312.60	78.15	$17\frac{1}{2}\%$	
16.20	6.48	$23\frac{1}{3}\%$	

Part II

4. The gross cost of an article is \$16. If the cost of selling is $24\frac{2}{3}\%$ of the selling price, for how much must this article be sold to make a net profit of $8\frac{2}{3}\%$ on the selling price?

5. The net cost of an article was \$49.52. The buying expenses amounted to 5% of the net cost. (a) If this article was sold at a profit of \$28, what was the selling price? (b) What was the per cent of profit on the selling price?

6. A dealer bought an article for \$32.40, less $12\frac{1}{2}\%$ discount. The cost of buying was 2% of the net cost. If he sold the article for \$40.50, what even per cent of profit did he make on the gross cost?

7. A fur piece cost \$36, less $12\frac{1}{2}\%$. It was sold for \$70, less 20%, and the cost of doing business was 25% of the selling price. The profit was what per cent of the gross cost?

8. The profit from the sale of a coat was \$14. If the per cent of profit on the gross cost was $33\frac{1}{3}$, what were (a) the gross cost, and (b) the selling price?

9. A dealer bought a chair for \$45, less 10% discount. He sold it for \$70, less 20% discount. The cost of buying was \$1.50. (a) What per cent of profit did he make on the gross cost? (b) The profit was what per cent of the net selling price?

10. The net cost of a gas stove was \$57.50. The freight and cartage were 4% of the net cost. The stove was sold at a profit of \$14.95. (a) What was the selling price? (b) The profit was what per cent of the gross cost?

TEST 31

To follow Assignment 31B

PART I

1. Find the commission and the net proceeds of the following: (10)

Sales	*Rate of Commission*	*Commission*	*Net Proceeds*
\$1286.00	4 %	\$	\$
378.40	$2\frac{1}{2}$%		
275.60	5 %		
312.70	6 %		
	Totals	\$	\$

2. Find the commission and the net proceeds of the following: (10)

Sales	*Freight Paid*	*Rate of Commission*	*Commission*	*Net Proceeds*
\$3500	\$244.00	3 %	\$	\$
2400	112.60	$3\frac{1}{2}$%		
1860	97.40	$3\frac{3}{4}$%		
1580	88.20	$4\frac{1}{2}$%		
		Totals	\$	\$

3. Find the gross sales and the net sales of the following: (10)

Rate of Commission	*Commission*	*Gross Sales*	*Net Sales*
6 %	\$366.60	\$	\$
$5\frac{1}{2}$%	70.62		
$4\frac{3}{4}$%	116.85		
$3\frac{1}{3}$%	120.40		
	Totals	\$	\$

4. Find the gross sales of the following: (10)

Rate of Commission	*Net Sales*	*Charges*	*Gross Sales*
3%	$1905.10	$34.90	$
4%	4407.80	56.20	
6%	3810.50	43.50	
2%	2341.80	39.60	
		Total	$

Part II

5. An agent sold 640 bu. of wheat, at $2.05 a bushel, on a commission of 3%. The other charges were: freight, $112.60, and storage, $30. Find the net proceeds.

6. O. E. Moore & Co., Chicago, Ill., sold for account of A. J. Henderson, Buffalo, N. Y., a consignment of apples containing the following amounts:

October 29, 112 bbl. for $6.20 per bbl.
October 31, 87 " " 5.85 " "
November 2, 58 " " 5.37 " "

Find the net proceeds. The charges were: freight $132.60; cartage, $64.25; commission 3%. Prepare in correct form an account sales dated November 5, current year.

7. An agent remitted to his principal $7544.60, after retaining his commission of 5% and paying other charges amounting to $663.40. How many barrels of flour did he sell, at $10.80 per barrel?

8. An agent sold 2860 bu. of potatoes. After deducting his commission of 5%, and paying other charges amounting to $116.70, he remitted $5996.55 to his principal. Find the selling price per bushel.

9. D. B. Hart sent his agent an order to buy 4500 lb. of coffee. The agent paid 25¢ a pound for the coffee and $9 for cartage. If the agent charged 2% commission for buying the coffee, what was the total cost?

10. T. W. Harvey placed an order with M. A. King & Co. to buy 40,000 lb. of sugar. King & Co. paid $4\frac{3}{4}$¢ a pound for the sugar, and the charges were as follows: commission, 2%; cartage, $28.60; inspection, $8.40. Find the total cost of the sugar.

TEST 32

To follow Assignment 32B

Part I

1. How many articles will (10)

$45 buy at $33\frac{1}{3}¢$ each?
24 " " $12\frac{1}{2}¢$ "
18 " " $14\frac{2}{7}¢$ "
15 " " $37\frac{1}{2}¢$ "
57 " " $12\frac{2}{3}¢$ "

Total _____

2. Find the cost of each of the following: (10)

7	articles	at	$15.00	per	dozen
19	"	"	14.40	"	"
53	"	"	27.60	"	"
17	"	"	37.80	"	"
49	"	"	17.40	"	"

$

Total $_____

3. Find the selling price of each of the following: (10)

Cost	*Per Cent Gained*	*Selling Price*
$4.00	$37\frac{1}{2}\%$	$
3.30	$16\frac{2}{3}\%$	
96.80	25 %	
38.40	$12\frac{1}{2}\%$	
.32	$62\frac{1}{2}\%$	

Total $_____

4. Find the time each day during which an automobile party was on the road: (10)

Started	*Stopped*	*Hours, Minutes*
6:47 A.M.	6:15 P.M.	
7:21 A.M.	5:47 P.M.	
7:13 A.M.	6:31 P.M.	
6:43 A.M.	5:52 P.M.	
8:15 A.M.	4:48 P.M.	

Part II

5. A Buffalo grain dealer bought in Duluth, Minn., 64,000 bu. of wheat at $1.77 a bushel. The commission for buying was $\frac{3}{4}¢$; the handling charges, $1\frac{1}{2}¢$; and the freight to Buffalo, $3\frac{3}{4}¢$ a bushel. The wheat was sold in Buffalo for $2.07 a bushel, the charges for handling being $1\frac{1}{2}¢$ a bushel, and the com-

mission $\frac{1}{2}$¢ a bushel. What was gained or lost, if there was a shrinkage of 2460 pounds? (1 bushel = 60 pounds.)

6. An agent expended $10,374.20 in buying cotton. This sum included cartage, $140; storage, $24, and his commission of 2%. How many pounds did he buy, at 22¢ a pound?

7. A machine shop owner was offered a lathe for $1850, subject to discounts of 20% and 8%. Another dealer offered the same lathe for $2250, less 30% and 12$\frac{1}{2}$% discounts. Which is the better offer, and how much?

8. J. D. Webster, of Manchester, Vt., sent L. E. Cooper & Co., of New York City, 300 gallons of maple syrup to be sold on commission. On April 7, 1929, the Cooper Company sold 120 gallons at $3.65 a gallon; on April 10, they sold 140 gallons at $3.60 a gallon; and on April 12, they sold the remainder at $3.55 a gallon. The freight charges were 7$\frac{1}{2}$¢ a gallon, and the commission 5%. Write out an account sales.

9. At what price must shoes, listed at $8 a pair, less 10%, be marked so as to allow a discount of 20% on the marked price, and still make a profit of 40% on the net cost?

10. A dealer shipped 40 crates of eggs, containing 30 dozen each, to his agent to sell, and instructed him to invest the proceeds in Y. H. No. 1 tea. The agent paid $12.80 freight on the eggs, and sold them at 46¢ a dozen. His commission for selling the eggs was 3%, and for buying the tea, 2%. How many 50-pound cartons of tea did he buy at 48¢ a pound and how much of the proceeds did he have left to remit to his principal?

TEST 33

To follow Assignment 33B

Part I

1–2. Find the interest on each of the following at 6%: (10)

1200 for 27 days	$390 for 21 days
559 for 30 days	600 for 46 days
780 for 81 days	480 for 37 days
2500 for 9 days	498 for 15 days
1760 for 15 days	720 for 29 days

3. Find the exact time for each of the following (use the current year): (10)

(a) From February 1 to August 6
(b) From March 10 to September 14
(c) From June 11 to December 16
(d) From September 9 to August 11
(e) From October 13 to February 14

4. Find the interest on the following at 6% (use the current year): (10)

(a) $850 from January 8 to July 6

(b) 1340 from April 4 to August 5

Part II

5. Find the interest on $1865.20 from June 9, 1928, to November 14 1928, at 6% and at 5%.

6. Find the interest on $2940 from October 4, 1928, to June 7, 1929, at $5\frac{1}{2}$% and at 4%.

7. Find the interest on $3575.50 for 9 months and 18 days at $4\frac{1}{2}$% and 3%.

8. Find the interest on $17,845 for 1 year, 7 months, and 29 days, at 6% and at 9%.

9. A dealer bought goods amounting to $1500 list price, on 90 days' credit or 8% discount for cash. How much would he gain by borrowing the money at 6% and paying cash for the goods?

10. A savings bank pays interest on its deposits, at the rate of 4%, and adds the interest to the balance on January 1 and July 1 of each year. A depositor's balance on July 1, 1927, was $650. If he made no withdrawals, how much did he have in the bank on July 1, 1929? (No interest is allowed on the fractional part of a dollar.)

TEST 34

To follow Assignment 34B

Part I

1. Find the exact interest on $312.60 from July 2, 1928, to April 4, 1929, at 6%. (10)

2. Find the exact interest on $1590 from May 19, 1928, to June 17, 1929, at 4%. (10)

3. Find the exact interest on $780 from September 14, 1928, to March 17, 1929, at 5%. (10)

4. Find the difference between the ordinary and the exact interest on $1200 from December 5, 1928, to July 9, 1929, at 6%. (10)

Part II

5. O. M. Cummings received from D. J. Hooker a note for $650, dated July 10, 1928, for one year. Cummings kept this note until November 17, when he discounted it at the Merchants Bank at 6%. Find the proceeds placed to Cummings' credit.

6. L. M. Kempt, Buffalo, N. Y., made a note payable to himself for $5000. He dated it July 8, 1929, and made it payable four months after date at the first National Bank of Buffalo. J. C. Loomis, of Buffalo, endorsed this note; and Kempt had it discounted at 6% at the First National Bank. Write this note, complete form, and find the proceeds.

7. Hammond & Company bought an invoice of goods, dated October 4, 1928, amounting to $1894.60. The terms were 4 months' credit, or 10% discount for cash in 10 days. How much would Hammond & Company gain by discounting their 4-months' note for $1750 and paying cash?

8. D. W. Howe purchased from E. H. Marlow & Company, of New York City, an invoice of goods amounting to $2460, less $12\frac{1}{2}\%$ and 4% discount. D. W. Howe accepted a 90-day trade acceptance, dated August 10, 1929, payable at the Traders Bank of New York. Marlow & Company had this acceptance discounted at 6% on August 24, 1929. Find the proceeds.

9. The firm of A. T. Good & Company had the following notes discounted at the Farmers and Merchants Bank of Denver, Col., on January 3, 1929: note for 6 months, from T. H. Bruce, dated October 24, 1928, for $1500; note for 9 months, from G. W. Green, dated November 7, 1928, for $780. Find the proceeds of each note.

10. A 90-day note for $2752, dated October 5, 1928, was discounted at a bank on November 23, 1928, at 6%. Find the term of discount and the proceeds.

TEST 35

To follow Assignment 35B

PART I

1–2. Find the proceeds of the following notes: (20)

Face	*Date*	*Time*	*Date of Discount*	*Rate of Discount*	*Proceeds*
$1500	Oct. 1	6 months	Nov. 5	6%	$
700	June 10	4 "	July 15	6%	
2500	May 4	3 "	June 8	6%	
4000	Sept. 6	8 "	Oct. 10	6%	
3250	Jan. 15	9 "	March 25	6%	
					$_____

3. Find the proceeds of the following notes: (10)

Face	*Date*	*Time*	*Interest*	*Date of Discount*	*Rate of Discount*	*Proceeds*
$800	April 1	4 months	6%	May 5	6%	$
1200	July 5	6 "	6%	Sept. 1	6%	
						$_____

Part II

4. Find the true discount on a debt of \$6500, paid 3 months before it is due, if money is worth 6%.

5. Find the difference between the true discount and the simple interest on \$1250 for 4 months, at 6%.

6. When money is worth 6% interest, what cash offer is equivalent to an offer of \$1850 on 4 months' credit?

7. A speculator bought a house for \$12,000. He kept it 15 months, paid \$900 for repairs and taxes, and sold it for \$15,000 on 6 months' credit. What did he gain, if money was worth 6%?

8. A dealer offers to sell an automobile for \$1840 on 15 months' credit or for \$1700 cash. If money is worth 6%, which is the better offer, and how much better?

9. A merchant bought goods amounting to \$5000 on 4 months' credit. After holding the goods 9 months, he sold them at an advance of 20%, giving the purchaser 2 months' credit. What was his gain, money being worth 6%?

10. My son, who is 12 years old, has just entered high school. How much should I invest at 6% simple interest, so that I may have \$5000 with which to send him to college when he graduates from high school four years later?

TEST 36

To follow Assignment 36B

Part I

1–2. Find the interest on the following amounts: (15)

Amount	*Time*	*Rate*	*Interest*
\$720	93 days	6%	\$
360	66 "	5%	
480	72 "	4%	
960	88 "	6%	
1248	33 "	3%	
		Total	\$_____

3–4. Find the proceeds of the following notes: (25)

Face	*Date*	*Time*	*Date of Discount*	*Rate of Discount*	*Proceeds*
\$1000	Oct. 1	6 months	Oct. 15	6%	\$
1850	July 2	4 months	Aug. 1	6%	
925	May 1	9 months	Sept. 6	6%	
1500	April 4	1 year	July 1	6%	
3000	Sept. 15	8 months	Oct. 22	6%	
				Total	\$_____

Part II

5. Find the discount and proceeds of a 90-day, 6% interest-bearing note for $5260, dated July 10, 1928, and discounted August 5, 1929, at 6%.

6. Find the difference between the simple interest and the true discount on $1560 for 4 months, at 6%.

7. Find the difference between the accurate interest and the ordinary interest on $12,500 for 172 days, at 6%.

8. What amount can a speculator afford to pay for property that is rented for $12,000 a year, so that his investment will pay him 8% interest, after paying expenses of $2800 a year?

9. A merchant is offered a discount of 4% or 4 months' credit on a purchase of goods amounting to $2460.50. He discounted his 4-months' note at a bank at 6% for such an amount that the proceeds of the note would just pay the net amount of the bill. How much did he gain by discounting his note and taking advantage of the 4% discount offered?

10. A merchant is offered $1200 worth of merchandise on 9 months' credit or 5% discount for cash. Which is the better offer, and how much better, if money is worth 6% interest?

TEST 37

To follow Assignment 37B

Part I

1–2. Find the true discount on each of the following debts: (20)

Amount	*Time*	*Rate of Discount*	*Proceeds*	*True Discount*
$850	7 months	6%	$	$
1360	5 months	6%		
2940	3 months	6%		
1750	126 days	4%		
		Totals	$	$

3–4. Find the bank discount on each of the following notes: (20)

Face	*Date*	*Time*	*Interest*	*Date of Discount*	*Rate of Discount*	*Discount*
$1000	April 1	90 days	6%	April 10	6%	$
800	June 10	4 months	6%	July 3	6%	
3000	July 1	6 months	5%	Aug. 6	6%	
2350	Sept. 4	60 days	6%	Oct. 1	6%	
					Total	$

Part II

5. A man deposited \$400 in a savings bank on January 2 and July 1 for three consecutive years. If the bank paid $4\frac{1}{2}\%$ interest and added the interest to the principal every 6 months, how much had he in the bank at the end of three years? (Interest was not allowed on amounts less than one dollar.)

6. The cash price of a piano is \$400; the price of the same instrument on six months' credit is \$425. (a) The difference in the prices is equal to what rate of interest on the cash price? (b) If money is worth 6% interest, what per cent is allowed for bad debts?

7. On July 6, Jarvis borrowed \$40,000 for 8 months at 6% interest. He purchased 32,000 bu. of potatoes at \$1.25 per bushel. Seven months later he sold the potatoes for \$1.55 a bushel. (a) How much did he make? (b) What was his per cent of profit on the cost?

8. A man borrowed \$6250 on January 2. On August 15, he paid the note with interest, the whole sum amounting to \$6445.31. What rate of interest did he pay? (Use the current year.)

9. A merchant bought \$3748.50 worth of goods on 4 months' credit. He gave his 4-months', 6% interest-bearing note in settlement for such an amount that the face of the note plus the interest when due will just equal the cost of the goods. Find the face of the note.

10. A dealer marked a stove to be sold for \$180. He finally sold the stove for \$150, at a profit of 25%. (a) How much did the stove cost him? (b) If he had sold it at the marked price, what would have been the per cent of profit on the cost?

TEST 38

To follow Assignment 38B

Part I

1–2. Find the ordinary interest on the following: (20)

Principal	*Time*	*Rate*	*Interest*
\$1500	4 months, 6 days	6%	\$
2650	3 " , 19 "	6%	
3520	2 " , 17 "	6%	
2940	6 " , 27 "	6%	
3815	7 " , 8 "	6%	
			\$

3–4. Find the bank discount on the following notes: (20)

Face	*Date*	*Time*	*Rate of Interest*	*Date of Discount*	*Rate of Discount*	*Discount*
$ 300	Nov. 1	4 months	6%	Nov. 15	6%	$
1250	Dec. 10	90 days	6%	Dec. 26	6%	
960	Oct. 6	60 days	6%	Oct. 18	6%	
4270	July 5	6 months	6%	Sept. 10	6%	
						$

Part II

5. On a note for $1500, at 6%, for two years from January 15, 1927, the following payments were endorsed: July 15, 1927, $300; October 15, 1928, $300. How much was due January 15, 1929?

6. On July 2, 1926, a mortgage for $5000 was given, bearing interest at 5%, on which the following payments were made: January 2, 1927, $500; July 2, 1927, $500; January 2, 1928, $1000; July 2, 1928, $1000; January 2, 1929, $800. How much was due July 2, 1929?

7. A man purchased a house and lot for $8000 by paying $3000 cash, and giving a purchase money mortgage for $5000, at 6% interest, on which he agreed to pay $1000 per year until it was paid. How much did the house cost him?

8. A dealer bought a used auto truck for $1200. He kept it 4 months, paid $135 for repairs, and sold it for $1475 on 8 months' credit. What was his gain or loss, if money was worth 6%?

9. A man agreed to pay a debt of $1800 in 6 semiannual installments of $300 each, plus the interest at 5% per annum on the unpaid balance. What amount of interest did he have to pay?

10. On an invoice of goods amounting to $2800, a trade discount of $12\frac{1}{2}$% and 4%, and a credit of 6 months were allowed. What should have been the total discount allowed for cash payment, money being worth 6%? (Find the present worth of the amount due in six months. Deduct the present worth from the list price of the goods.)

TEST 39

To follow Assignment 39B

Part I

1–2. Find the taxes on the following pieces of property: (20)

Valuation	*Tax Rate*	*Taxes*
$23,400	$.0048	$
15,900	.01542	
9,250	.02132	
48,600	.00876	
51,400	.03151	
	Total	$

3–4. Find the taxes on the following pieces of property: (20)

Valuation	*Tax Rate*	*Taxes*
$26,000	$1.83 per $100	$
84,600	1.962 " "	
92,000	1.425 " "	
158,500	1.280 " "	
75,500	1.075 " "	
	Total	$

Part II

5. In a certain village, the assessed valuation is $2,844,500 and the amount of tax to be raised is $40,391.90. What must be the tax rate to raise this amount?

6. In a certain city, the amount to be raised by taxes for schools is $317,980, and the amount to be raised for city and state expenses is $595,800 The assessed valuation of the property is $42,800,000. What will be the tax rate in this particular year?

7. The valuation of the property in a town is $1,987,500. The amount of tax levied for the town's expenses is $12,918.75, and the tax rate for county and state expenses is $5\frac{1}{2}$ mills. Find the total tax to be paid on a farm assessed for $6500.

8. A man owns $15,400 worth of taxable property. The total valuation of taxable property in his town is $840,000. The expenses are: for schools, $2400, and for town, county, and state expenses, $12,300. How much tax must he pay?

9. In a village, taxes are levied as follows: for street improvements, $5600; for salaries, $7500; for schools, $9500; for sinking fund, $2700; for incidentals, $1500. The assessed valuation of the property is $4,561,280. Find the tax rate to four decimal places.

10. The cost of the public schools of a city for the year 1929 was $47,565, and the taxable property of the city was assessed at $4,530,000. How many mills on a dollar must be assessed for school purposes?

TEST 40

To follow Assignment 40B

Part I

1. Find the amount of duty and the total cost in New York of the following articles: (10)

Articles	*Specific Duty*	*Duty*	*Total Cost*
2000 lb. Butter	@ 42¢ 8¢ a pound	$	
1000 lb. Cheese	@ 74¢ 5¢ a pound		
144 qt. Olive Oil	@ 74¢ 50¢ a gallon		
1250 lb. Baking Soda	@ 21¢ ¼¢ a pound		
	Freight to New York		$84.20
	Total	$	$

2. Find the duty on the following articles: (10)

Articles		*Duty*	*Amount*
1000 lb. Steel Wire	@ 2⅞¢	¾¢ specific	$
750 lb. Nails	@ 3⅛¢	$\frac{4}{10}$¢ "	
240 lb. Screws	@ 6⅞¢	25% ad valorem	
1 gross Pocket Knives	@ $6.60 per doz.	50% " " 14¢ each specific	
11 gross Safety Razors	@ $12.60 per doz.	30% ad valorem 10¢ each specific	
		Total	$

Part II

3. A dealer purchased in London 20 gross of handkerchiefs, at £6, 8s., 6d. a gross; and 6 gross of woven mufflers, at £9, 9s., 4d. a gross. The duty was 55% ad valorem and the freight to Boston was £2. Find the total cost. (Exchange, $4.8665.)

4. A merchant imported 2500 doz. pairs of cotton stockings, invoiced at £826, 12s. The duty was 30% ad valorem. Exchange to pay for the invoice was bought at $4.875. How much per pair did the stockings cost?

5. (a) Find the cost of 10 gross of silk handkerchiefs, purchased at 125 francs a dozen, on which a duty of 55% ad valorem was paid. (b) For how much should each handkerchief be sold to gain 66⅔% on the cost? (Exchange, 3.91¾¢.)

6. A merchant remitted to a London firm a demand draft in pounds sterling, bought at \$4.885, to pay for an invoice of goods for which he paid \$3263.18. How large a draft did he remit?

7. An exporter in Boston drew a draft through his bank on a firm in Paris for \$15,800. If the exchange rate is \$0.0391¾, how many francs will be required to pay this draft?

8. A traveler purchased the following checks: 10 of \$50 each; 15 of \$20 each; 20 of \$10 each. If the bank issuing the checks charged ½%, what were the total bank charges?

9. Using either the current rate of exchange or the rate given, find the cost of the following drafts: 1 on Paris for \$1500; 2 on Berlin for \$1850 each; 3 on London for \$3000 each. (Exchange rates: franc, \$0.0395; mark, \$.238; pound, \$4.845.)

10. (a) What would be the cost of a draft to pay for 2500 lb. of writing paper purchased in Paris at 3 francs per pound, if the exchange rate was \$0.0391¾? (b) Find the total cost of this paper in U. S. money, if the duty was 3¢ a pound specific, and 15% ad valorem?

TEST 41

To follow Assignment 41B

Part I

1. (a) Multiply $411\frac{3}{4}$ by $87\frac{1}{2}$. (5)

(b) Subtract $213\frac{2}{3}$ from $407\frac{3}{8}$. (5)

2. (a) Divide 259,733.8478 by 3140.52. (5)

(b) Add $15\frac{2}{3}$, $7\frac{3}{4}$, $9\frac{1}{4}$, $11\frac{5}{6}$, $17\frac{1}{8}$. (5)

Part II

3. A house valued at \$15,000 was insured for ⅔ of its value at 65¢ per \$100, for 3 years, and the contents, valued at \$4500, were insured for ⅗ of their value, at 80¢ per \$100, for 3 years. What is the cost per year for carrying the insurance?

4. A building insured for \$12,000 on a 3-years' policy, at 50¢ per \$100, is damaged by fire to the extent of \$7500, as adjusted for the insurance company to pay. What is the insurance company's net loss?

5. A store building valued at \$25,000, and contents valued at \$7500, are insured for ⅘ of their values. Fire caused a loss of \$5500 on the building and \$2500 on the contents. The policy contained the 80% co-insurance clause. (a) Find the amount payable. (b) How much did the owner lose?

6. A school building, valued at \$75,000, was insured for 80% of its value by means of five policies for equal amounts in five different companies. (a) If the rate is 60¢ per \$100 for three years, what is the total premium?

(b) If fire causes a loss amounting to $45,000, how much will each company have to pay?

7. A man took out a 20-year endowment policy for $2000, on which the annual premium was $96.76. When the policy became due, he received $2480.65. (a) How much more did he receive than he paid in? (b) If he had deposited his premiums in a bank at 4% per annum, how much would he have had? (Use compound interest table.)

8. A man at the age of 24 took out a $5000 twenty-payment life policy on which he paid an annual premium of $155.60. He died after paying 8 premiums. (a) How much more did his family receive than he had paid in, if they received the face of the policy? (b) If he had taken out an endowment policy and paid a premium of $246.40 annually, how much more would his premiums have cost him?

9. A man 28 years of age took out an endowment policy for $10,000, at an annual premium of $494.70. He died after making 10 payments. How much less would his insurance have cost him if he had taken an ordinary life policy, on which the premium would have been $231.24?

10. An apartment house which was insured for $245,000 was damaged by fire and water to the amount of $175,000. The risk was distributed as follows:

(a) Hartford Company	$84,000
(b) Etna Company	70,000
(c) Phoenix Company	35,000
(d) Provident Company	56,000

What was the net loss of each company, if the premium paid was $1\frac{3}{4}$% and each policy contained the 80% co-insurance clause?

TEST 42

To follow Assignment 42B

Part I

1. Find the dividend on the following stock: (10)

No. of Shares	*Stock*	*Dividend %*	$
120	P. R. R.	$2\frac{3}{4}$ semiannually	
80	U. P. R. R.	$1\frac{1}{8}$ quarterly	
340	L. V. R. R.	$5\frac{1}{2}$ annually	
200	N. U. C. R. R.	$7\frac{3}{8}$ annually	
150	B. & M. R. R.	$3\frac{1}{4}$ semiannually	
Shares, $100 par value		Total	$

2. Find the rate of interest, correct to three decimal places, which the following bonds yield: (10)

Purchase Price	*Bond Rate*	*Rate of Interest*
\$88	5%	
95	6%	
112	6%	
120	7%	

Part II

3. What annual income is derived from investing \$35,000 in R. I. R. R. stock at 70, if a $2\frac{1}{2}\%$ semiannual dividend is declared?

4. The U. P. R. R. Co. declared a semiannual dividend of $2\frac{3}{4}\%$ on a capital stock of \$128,000,000. (a) What was the total semiannual dividend? (b) What was the semiannual income of a stockholder who owned 7000 shares of this stock having a par value of \$100 each?

5. Find the annual income of a person who invested \$75,150 in A. T. T. Company stock at 75, paying a dividend of $4\frac{1}{2}\%$ annually; and \$40,075 in American Tobacco Company stock at 80, paying a dividend of $2\frac{5}{8}\%$ semiannually. (Brokerage, 15¢ a share in each case.)

6. The capital stock of the Greendale Improvement Company is \$2,250,000. The gross earnings for a year are \$435,000, and the operating expenses are \$212,400. If 10% of the net earnings is set aside as a surplus fund, (a) what even per cent of dividend can be declared, and (b) what would be the amount of undivided profits?

7. How much must be invested in Westinghouse preferred at $128\frac{1}{2}$, paying an annual dividend of 8%, to yield an annual income of \$4800, if brokerage is $\frac{1}{8}\%$?

8. Which is the better investment and how much better: N. Y. C. R. R. at 150, paying an annual dividend of $8\frac{1}{2}\%$, or S. P. R. R. stock at 112, paying an annual dividend of $6\frac{1}{4}\%$? (No brokerage charge.)

9. Which would be the more profitable investment, and how much more: 4% bonds at $90\frac{3}{8}$, or 5% bonds at $102\frac{3}{8}$, brokerage $\frac{1}{8}\%$ in each case? (Carry results to four decimal places.)

10. A man invested \$5910 in Consolidated Gas $5\frac{1}{2}\%$ bonds at $98\frac{1}{2}$. He kept the bonds one year, received his interest, and then sold them for $103\frac{3}{4}$. How much did he make on this investment? (No brokerage charge.)

TEST 43

To follow Assignment 43B

Part I

1. Find the interest income on the following bonds: (10)

		Interest
12—	$1000 bonds at 4½%	$
25—	500 bonds at 5 %	
50—	100 bonds at 5½%	
18—	5000 bonds at 5 %	
7—	10,000 bonds at 4 %	
	Total	$

2. Find the face, or par, value of the following bonds: (10)

Annual Interest Income	*Rate of Interest*	*Par Value*
$55	5½% annually	
450	4½% annally	
275	2¾% semiannually	
45	2¼% semiannually	
500	2½% semiannually	

3. Find the market value of the following stock, if money is worth 6% interest: (10)

			Market Value
(a)	Annual dividend	7½%	$
(b)	Annual dividend	4½%	
(c)	Semiannual dividend	2¾%	
(d)	Semiannual dividend	3⅜%	
(e)	Annual dividend	8 %	

Part II

4. What price per share was paid for stock, if 150 shares cost $13,530, including brokerage at $20 per 100 shares?

5. What price must be paid for stock paying a dividend of 3¾% semiannually, to yield an income of 6% on the amount invested?

6. The Yates Tile Company paid an annual dividend of $7187.50 on a capital stock of $125,000. (a) What was the rate of dividend? (b) How much dividend did a stockholder receive who had 50 shares of stock, par value $100 each?

7. Municipal bonds bearing 5¼% interest are sold for $104.50. What per cent of return does the buyer get on his investment? (Compute the result to the nearest thousandth.)

8. A corporation with a capital stock of $350,000, of which $100,000 is 7% preferred stock and $250,000 is common stock, had net earnings for the year amounting to $42,780. (a) After deducting the Federal tax amounting to 12% of the net earnings, paying the dividend on the preferred stock, and putting 10% of the net earnings into the surplus fund, what rate of dividend to the nearest $\frac{1}{2}$% can be declared on the common stock? (b) How much remains in undivided profits?

9. J. C. Halsey deposited $1000 with his broker and directed him to buy 100 shares of American Sugar Company stock. The broker bought the stock at $91\frac{1}{2}$. Thirty days later the broker was ordered to sell the stock, which he did at $87\frac{3}{4}$. The broker charged 6% interest on the money loaned to Mr. Halsey, and $\frac{1}{8}$% brokerage for both buying and selling. The Federal tax was 2¢ per share on the sale of the stock. How did Mr. Halsey's account stand after the transaction?

10. O. M. Lansing sent $10,000 to his broker and directed him to buy Studebaker 6% preferred stock. The broker purchased the stock at $91\frac{1}{4}$; brokerage, $20 per 100 shares. (a) How many shares did the broker buy? (b) How much was the unexpended balance?

TEST 44

To follow Assignment 44B

Part I

1. Find the cost of each of the following bank drafts: (10)

Face	*Rate of Exchange*	*Cost*
$2800	$\frac{1}{4}$% premium	$
1260	$\frac{1}{6}$% discount	
2500	$\frac{1}{8}$% premium	
3750	$\frac{1}{3}$% premium	
1860	3¢ per $100 premium	
	Total	$

2. Find the cost of the following bank drafts: (10)

	Cost
$7,500 at $\frac{1}{16}$% discount	$
27,500 at 45¢ per $1000 premium	
5,160 at $\frac{1}{10}$% premium	
1,680 at $7\frac{1}{2}$¢ per $100 premium	
40,000 at $\frac{1}{20}$% discount	
Total	$

Part II

3. A merchant purchased a \$2500 bank draft for \$2492.50. (a) What was the rate of exchange, and was it at a premium or at a discount? (b) At this same rate of exchange, find the cost of a draft for \$3412.70.

4. A jobber bought goods invoiced at \$12,840.60, less 5% for cash or 60 days' credit. To take advantage of the cash discount, he discounted a 60-day draft for the gross amount of the invoice at 6%, collection $\frac{1}{10}$%. How much did he make by the transaction?

5. A manufacturer drew a 90-day draft on a jobber for \$5875 and sold it to the Traders National Bank; collection, $\frac{1}{8}$%, and interest, 6%. Find the proceeds.

6. Find the cost of a draft for £1240, 6s., 4d. at \$4.865.

7. A New York merchant owed a Paris firm 52,780 francs. Find the cost of a draft to pay this account, if the exchange rate is \$0.0391$\frac{1}{2}$.

8. (a) Find the cost of a draft on London for \$1580.80, if the rate of exchange is \$4.864. (b) Find the cost of a draft on Paris for \$2738.40, if the rate of exchange is \$0.0391$\frac{1}{5}$.

9. Change \$25,000 (a) to English money, (b) to French money, and (c) to German money. (Refer to quotations in the newspapers or the foreign exchange tables in this book.)

10. An exporter in London drew a draft on a New York importer for £780, 14s., 6d. How much did the importer have to pay if the pound Sterling was quoted at \$4.864?

TEST 45

To follow Assignment 45B

Part I

1. Divide \$3600 among E, F, and G in proportion to 6, 9, and 12, respectively. (10)

2. Invoices of goods purchased on 60 days' credit are dated as follows: June 16, July 12, and August 7. Find the equated date of settlement. (10)

3. Find the average date of the following charges: (10)

1929		
January	4, Mdse.,	\$300
February	14, Mdse.,	450
March	21, Mdse.,	600

Part II

4. Find the date on which the following accounts may be paid in one amount without loss to either party:

April 2, 1929, Mdse. 30 days, $300
May 6, 1929, Mdse. 60 days, 500
June 3, 1929, Mdse. 30 days, 400

5. When may the following bills be paid in one amount without loss to either party?

May 8, 1929, Mdse., 60 days, $250
June 4, 1929, Mdse., 30 days, 400
June 26, 1929, Mdse., 30 days, 550
July 10, 1929, Mdse., 10 days, 600

6. Find the equated date for paying the balance of the following account:

1929	*Dr.*	*Cr.*
Jan. 2, Mdse.,	700	
Jan. 15, Cash,		600
Feb. 4, Mdse.,	400	
Feb. 14, Cash,		200

7. Equate the following account:

O. W. OLIVER

1929					1929				
Apr.	1	Mdse., 30 days	200		May	1	Cash	200	
May	6	Mdse., 30 days	300		June	8	Cash	300	
June	4	Mdse., 30 days	400						

8. Equate the following account:

L. H. JOHNSON

1929					1929				
Jan.	1	Mdse., 90 days	250		Apr.	3	Cash	500	
Feb.	5	Mdse., 60 days	700		May	2	Cash	250	
Mar.	4	Mdse., 60 days	350						

9. Find the cash balance of the following account, Oct. 15, 1929, money being worth 6% interest:

A. J. MANN

1929					1929				
June	6	Mdse., 60 days	700		Aug.	5	Cash	500	
July	2	Mdse., 60 days	800		Sept.	2	Cash	700	
July	16	Mdse., 30 days	500						

10. Allowing that money is worth 6% interest, find the cash balance of the following account on Sept. 10, 1929:

H. H. HESSLER

1929					1929				
Jan.	2	Mdse., 60 days	1200		Mar.	4	Cash	1000	
Feb.	6	Mdse., 60 days	1500		Apr.	7	Cash	1000	
Mar.	4	Mdse., 30 days	900						

TEST 46

To follow Assignment 46B

Part I

1. Find (a) the balance of the following account, (b) the due date of each item and (c) the amount of cash paid to settle each separate invoice paid: (10)

J. B. CARMER

1929					1929				
Jan.	2	Mdse., 4/10 n/90	415	60	Jan.	12	Cash	415	60
Jan.	17	Mdse., 3/10 n/90	625	50	Jan.	27	Cash	625	50
Feb.	6	Mdse., 2/10 n/60	375	75					
March	10	Mdse., 5/10 n/4m	780	15					

2. Add the following horizontally and vertically. Prove results by adding totals: (10)

$28,712	$3,912	$15,924	$_____
34,317	21,642	37,582	_____
5,924	712	9,312	_____
587	1,592	14,821	_____
17,640	42,754	27,463	_____
$	$	$	$

Part II

3. Equate the following account:

O. E. ROGERS

1929					1929				
March	6	Mdse.	700		March	16	Cash	700	
April	4	Mdse.	690		April	14	Cash	500	
April	25	Mdse.	585						
May	7	Mdse.	1100						

4. Find the cash balance of the following account July 1, 1928, money being worth 6%:

W. D. HENDERSON

1929					1929				
Jan.	15	Mdse. 60 days	1200		April	15	Cash	700	
Feb.	4	Mdse. 90 days	750		June	10	Cash	900	
March	18	Mdse. 2 months	900						

5. Three partners engaged in business and invested \$5000, \$7000, and \$8000, respectively, gains and losses to be shared in proportion to investments. The first year their gain was \$3560, and for the second year it was \$5840. Find the present worth of each partner at the end of the second year.

6. Four partners in a hardware business invested the following capital: *A* invested \$12,000; *B*, \$18,000; *C*, \$20,000. The gain for the year, \$15,960, was divided equally among the partners, after 6% interest was allowed for the year on each investment and each partner drew a salary of \$50 per week. Each partner's personal account is credited with the interest on his investment and with his share of the net gain, and debited with his salary. Find each partner's present worth. (Each partner's present worth will be the sum of his capital invested and the credit balance of his personal account.)

7. Williams and Roberts were partners in the grocery business. Williams invested \$4000, and Roberts invested \$6000. At the end of the year their assets were \$21,300 and their liabilities were \$5900. Each partner drew a salary of \$1500 a year, after which the gain was divided in proportion to their respective investments. Find each partner's present worth.

8. Three partners had equal shares in a partnership business, and assets and liabilities at the close of the first year were as follows: cash, \$8740; merchandise in stock, \$9260; notes receivable, \$580; accounts receivable, \$1590; accounts payable, \$928.50; notes payable, \$700. (a) Find each partner's present worth. (b) If each partner invested \$8000 in the beginning, how much was the gain or loss?

9. *D* and *E* entered into a partnership on January 2, 1928. *D* invested \$3000, and *E* invested \$5000. On July 2, 1928, *D* invested \$1000, and *E* withdrew \$500. On October 2, 1928, *D* invested \$1500 and *E* invested \$1000. At the end of the year (January 2, 1929), the gain was \$5325, which the partners agreed to share in proportion to their average investments. Find each partner's present worth.

10. *A* and *B* engaged in business with a capital of \$15,000. *A* invested $\frac{2}{3}$, and *B*, $\frac{1}{3}$ of this amount. At the beginning of the second year, *A* invested \$2500 and *B* invested \$5000. At the end of two years their assets were \$31,832.40 and their liabilities were \$2957.40. What was each partner's present worth?

TEST 47

To follow Assignment 47B

Part I

1–2. Add: (5)

2846
3728
9264
1728
9361
7843
2964
3829

Total

Multiply: (5)

87493
786

Divide: (5)

972)783.432(

Find interest at 6% on: (5)

$925 for 66 days
375 " 93 days
585 " 75 days
480 " 20 days
750 " 36 days

$

$

Part II

3. If 81 bbl. of apples cost $526.50, how much will 137 bbl. cost at the same price per barrel?

4. A merchant sent three packages by parcel post to a place 950 miles distant. The packages weighed 28 lb., 14 lb., and 31 lb., respectively. They were insured for $75, $50, and $100, respectively. Find the cost of postage and insurance.

5. A coal dealer bought 175 tons of coal for $8.40 a ton, delivered at his yard. He sold $\frac{2}{5}$ of it at $12.50 a ton, and the remainder at $12.25 a ton. It cost him $2.25 a ton to deliver the coal that he sold. How much did he gain?

6. A bookkeeper receives a salary of $150 per month. How long will it take him to save enough money to purchase an automobile that costs $1477 complete, if his expenses average $26.50 a week? (52 weeks in a year)

7. Reduce 2 ft., 3 in. to the decimal of a yard.

8. Find the square root of 59,049.

9. (a) How many rods of fence will it take to enclose a farm 320 rods long and 160 rods wide? (b) How much will it cost, at $93\frac{1}{2}¢$ a rod?

10. Find the cost, at $47\frac{1}{2}¢$ per square foot, of building a cement walk 4 ft. wide, around the outside of a city block 500 ft. by 250 ft.

TEST 48

To follow Assignment 48B

Part I

1. Find the cost of: (10)

321 yards	@	$17\frac{1}{2}¢$	$
294 "	@	$31\frac{1}{3}¢$	
528 "	@	$12\frac{1}{2}¢$	
462 "	@	$14\frac{2}{7}¢$	
840 "	@	$83\frac{1}{3}¢$	
		Total	$

2. Find the interest at 6% on the following: (10)

$360 for 48 days		$
712 " 63 "		
280 " 45 "		
560 " 90 "		
640 " 15 "		
	Total	$

Part II

3. Multiply 24 sq. rd., 15 sq. yd., 11 sq. ft., 27 sq. in. by 9.

4. The hypotenuse of a right-angled triangle is 50 ft. and the altitude is 40 ft. (a) Find the base and the area. (b) How many sq. yd. are there in the area?

5. What will it cost to paint the outsides of 40, six-sided boxes, each 4 ft. long, 3 ft. wide, and 2 ft. high, at 15¢ per square yard?

6. Find the cost of plastering the walls and ceiling of a room 20 ft. long, 16 ft. wide, and $8\frac{1}{2}$ ft. high, at 80¢ per square yard, allowing for 1 door, 3 ft. by 7 ft., and two windows, 3 ft. by 5 ft.

7. Find the cost of the following lumber:

42 pc.	$8'' \times 2'' \times 16'$	@ $45	per M.
30 pc.	$2'' \times 4'' \times 14'$	@ 50	" "
50 pc.	$2'' \times 6'' \times 18'$	@ 54	" "
70 pc.	$12'' \times 1'' \times 12'$	@ 55	" "

8. How much will it cost, at 64¢ per cubic yard, to excavate for a cellar 40 ft. long, 24 ft. wide, and $5\frac{1}{2}$ ft. below the surface?

9. How much will it cost to carpet a room 22 ft., 6 in. long, and 12 ft., 6 in. wide, with carpet 30 in. wide, costing $2.40 per yard? (The strips run lengthwise of the room.)

10. Find the cost, at $7.50 per M., of the brick for a wall 6 ft. high, 80 ft., long, and 15 in. thick, allowing $\frac{1}{8}$ for mortar. (A common brick contains 64 cu. in.)

TEST 49

To follow Assignment 49

Part I

1. Make the extension for the following items: (10)

425 lb. @ $ .06		$
1500 lb. @ 1.25		
98 lb. @ .25		
36 lb. @ .16⅔		
3000 lb. @ 30.00 a ton		
	Total	$

2. Find the interest on each of the following at 6%: (10)

$450 for 90 days		$
350 " 18 "		
1200 " 69 "		
840 " 30 "		
112 " 45 "		
	Total	$

3. Find the selling price of each of the following: (10)

Cost	*Gain*	*Selling Price*
$2400.00	12½%	$
250.00	8 %	
54.00	33⅓%	
2.40	37½%	
95.00	5 %	
	Total	$

Part II

4. A butter and egg merchant's sales for one day were as follows:

321 lb.	A-grade butter	@ 46¢
214½ lb.	C. S. butter	@ 39¢
87 doz.	A-grade eggs	@ 83¢
112 lb.	F. C. Cheese	@ 31¢
43 doz.	select eggs	@ 78¢
178 lb.	mild cheese	@ 29¢

(a) Find his total sales. (b) If he made an average profit of 25% on his sales, what was his gross profit for the day?

5. Find the cost of the following lumber:

8 pcs. clear hemlock	3″ × 8″ × 14′ @ $44 per M.	$
24 pcs. yellow pine	2″ × 4″ × 16′ @ $48 per M.	
6 pcs. spruce	2″ × 8″ × 18′ @ $52 per M.	
100 pine boards	1″ × 10″ × 12′ @ $46 per M.	
240 pine sheeting boards	1″ × 7″ × 16′ @ $38 per M.	
	Total	$

6. (a) Find the cost of 3240 lb. of coal, at $14.50 per ton; 5860 lb. of coal, at $12.80 per ton; and 350 lb. of coal, at $16 per ton. (b) How much did it cost to deliver this coal, at 15¢ per 100 lb.?

7. A circular grass plot, 100 ft. in diameter, is enclosed with a fence at a cost of $12.50 per rod. How much did the fence cost?

8. At 78¢ per square yard, find the cost of plastering the walls and ceilings of two rooms, each 14 ft. wide, 18 ft. long, and 8 ft., 3 in. high, allowing for 2 doors, 3 ft. × 7 ft., and 4 windows, 3 ft. × 5 ft., in the two rooms.

9. A man bought a house and lot, and made the first payment of $2500. He still owed $\frac{4}{5}$ of the price he agreed to pay. (a) How much did he agree to pay? (b) How much remains unpaid?

10. What will it cost, at $1.50 per yard, to carpet a stairway of 22 steps, if the tread of each step is 11 inches and the riser is $7\frac{1}{2}$ in.?

TEST 50

To follow Assignment 50

Part I

1. Find the results of: (10)

(a) $\frac{5}{8} \times \frac{3}{4} \times \frac{3}{8} \div \frac{1}{8}$.
(b) $\frac{8}{9} \times \frac{2}{3} \times \frac{2}{3} \div \frac{1}{6}$.

2. (a) Multiply $46\frac{3}{8}$ by $29\frac{1}{4}$. (10)

(b) Divide $72\frac{3}{16}$ by $8\frac{1}{8}$.

3. How many pounds will (10)

$5.95 buy at $8\frac{1}{2}$¢ a pound?
7.60 buy at $6\frac{2}{3}$¢ a pound?
52.00 buy at $12\frac{1}{2}$¢ a pound?
11.84 buy at $12\frac{1}{3}$¢ a pound?

Total _____

Part II

4. Find the cost of the shingles, at \$5.75 per M., required to cover a roof 50 ft. long and 22 ft. from eaves to ridge on each side, with shingles 4 in. wide, laid 6 in. to the weather.

5. A contractor agreed to excavate for a cellar 6 ft. deep, 28 ft. wide, and 44 ft. long, at \$1.95 per cubic yard. The labor for digging and hauling cost him \$1.70 per cubic yard. If he sold the dirt for 25¢ per cubic yard, how much did he make on the job?

6. Green contracted to do a piece of work for \$485. He engaged Long and Hart to help him, agreeing to share with them proportionately. Green worked 37 days; Long worked 32 days, and Hart worked 28 days. What amount should each receive?

7. A dealer bought bags of potatoes for \$768. By selling them for \$3 a bag, he gained $\frac{1}{4}$ of the cost. How many bags did he buy?

8. A grocer mixed three grades of coffee as follows: 75 lb. of grade A, at 28¢ a pound; 90 lb. of grade B, at 26¢ a pound, and 85 lb. of grade C, at 23¢ a pound. (a) What was the average price of the mixture? (b) What profit did he make by selling it at 35¢ a pound?

9. (a) How many planks 16′ long, 12″ wide, and 2″ thick will be required to lay a barn floor 80 ft. long and 64 ft. wide? (b) What will the planks cost at \$45 per M.?

10. How much will it cost to dig a circular cistern, 9 ft. in diameter and 12 ft. deep, at \$1.60 per cubic yard? (Reckon the nearest whole number of cubic yards.)

TEST 51

To follow Assignment 51

Part I

1. Find the cost of the following: (10)

$87\frac{1}{2}$ yd. @ \$2.56	\$
$66\frac{2}{3}$ yd. @ \$1.83	
$12\frac{1}{2}$ yd. @ \$3.28	
$33\frac{1}{3}$ yd. @ \$2.88	
$62\frac{1}{2}$ yd. @ \$2.48	
Total	\$

2–3. In the following pay roll for the week ending June 18, 19—, find the total number of hours and the total wages of (a) each employee for the week, and (b) of all employees for the week: (20)

No. / *Name*	*Number of Hours' Work*						*Total No. of Hours*	*Wages per Hour*	*Total Wages*
	M.	*T.*	*W.*	*Th.*	*F.*	*S.*			
O. A. King	8	7	$7\frac{1}{2}$	$4\frac{1}{2}$	$6\frac{1}{2}$	3	.....	84¢	
L. H. Reed	8	$8\frac{1}{2}$	7	$7\frac{1}{2}$	9	4	.....	92¢	
D. E. Harris	4	8	8	$6\frac{1}{2}$	$8\frac{1}{2}$	$2\frac{1}{2}$	.....	88¢	
C. E. Hood	$7\frac{3}{4}$	8	9	$7\frac{1}{2}$	8	4	.....	92¢	
L. M. King	$3\frac{1}{2}$	8	8	6	$6\frac{1}{4}$	2	.....	95¢	
A. D. Walker	9	7	$8\frac{1}{2}$	$5\frac{3}{4}$	2	2	.....	90¢	
J. H. Moore	8	$7\frac{1}{2}$	$8\frac{1}{2}$	$7\frac{3}{4}$	4	4	.....	88¢	
M. O. Hart	7	7	7	$6\frac{1}{2}$	$6\frac{3}{4}$	4	.....	90¢	
A. D. Ling	8	8	8	$6\frac{1}{2}$	$6\frac{1}{4}$	4	.....	84¢	
T. E. Thomas	6	6	4	8	$7\frac{1}{4}$	$3\frac{1}{2}$	.....	92¢	
									$

Part II

4. A man owned a piece of land 312 rd. long and 280 rd. wide. He divided it into 4 rectangular fields of equal size and enclosed each field with a wire fence, at a cost of $1.80 per rod. (a) How much did the fence cost? (b) How much is the land worth, at $250 per acre?

5. A farmer desires to build a bin to hold 480 bu. of grain. If he builds the bin 6 ft. high and 8 ft. wide, how long will it have to be? (Use 1 bu. equal to $1\frac{1}{4}$ cu. ft.)

6. Find, in even gallons, the capacity of a cistern 8 ft. in diameter and 12 ft. deep. (231 cu. in. in a gallon.)

7. Reduce 8 cwt., 75 lb. to the fraction of a ton.

8. Reduce 120 sq. rd., 10 sq. yd. to the fraction of an acre.

9. The sides of a rectangular field measure 80 rd. and 72 rd. How many acres are there in the field?

10. (a) How many square feet of tin will be required to make the sides and bottom of a can 2 ft., 6 in. in diameter and 3 ft., 6 in. high? (b) How much will the tin cost, at $4\frac{3}{4}$¢ a square foot? (The bottom is cut from a square $2\frac{1}{2}$ ft. by $2\frac{1}{2}$ ft.)

TEST 52

To follow Assignment 52

Part I

1. Find the interest on the following at 6%: (10)

$672.00	for 46 days	$
58.92	" 30 "	
252.60	" 33 "	
440.00	" 96 "	
378.00	" 45 "	
	Total	$

2. Find the selling price of each of the following: (10)

Cost	*Gain*	*Selling Price*
$1672.00	$37\frac{1}{2}\%$	$
447.00	$33\frac{1}{3}\%$	
242.50	8 %	
450.00	$16\frac{2}{3}\%$	
912.00	$66\frac{2}{3}\%$	
	Total	$

3. Find the result of each of the following: (10)

$\frac{1}{8}\%$	of $240.88	$
250%	" 99.80	
$37\frac{1}{2}\%$	" 260.96	
$\frac{1}{10}\%$	" 214.45	
$\frac{3}{4}\%$	" 16.80	
	Total	$

Part II

4. A maker of automobiles estimated that his factory buildings would depreciate 2% each year, and that his plant equipment would depreciate 8% each year. In each case, the depreciation was figured on the original valuation. The buildings were valued at $250,000, and the plant equipment was valued at $1,500,000. Find the value of each at the end of the fifth year.

5. A store building, valued at $50,000, was insured in one insurance company for $22,500 and in another company for $17,500. (a) What per cent of the insurance did each company carry? (b) For what per cent of its value was it insured in each company?

6. A man purchased an automobile for $925, on the deferred payment plan, by paying $125 cash and $70.75 a month for 12 months. The amount he paid each month was $\frac{1}{4}$ of his monthly income. (a) What did the car cost him? (b) How much was his income for the year?

7. A man bought a house and lot for $11,250. The lot cost $87\frac{1}{2}\%$ less than the house cost when built. Find the cost of each.

8. A merchant who failed in business had assets amounting to $12,723.20, and his liabilities were $17,920. (a) How much can he pay on the dollar? (b) How much will a creditor receive whom he owes $1340?

9. A dealer in household supplies purchases goods amounting to $1485, list price. He is offered his choice of 10%, 10%, and 5% discount with 30 days' credit, or 25% discount for cash. Which is the better offer, and how much better, if money is worth 6%?

10. *A*, *B*, and *C* are partners in a business which shows a profit of $15,428.40 for the year. *A*'s investment is $12,000; *B*'s, $16,000, and *C*'s, $20,000. After deducting 6% interest on each partner's investment for the year from the profit, the remainder was shared equally. Find each partner's share.

TEST 53

To follow Assignment 53

PART I

1. Make the extension and find the total: (10)

532 lb. @ $12\frac{1}{2}¢$	$
250 lb. @ $1.60	
96 lb. @ $6\frac{1}{2}¢$	
180 lb. @ $2.50	
150 lb. @ $24\frac{1}{2}¢$	
Total	$

2. (a) Divide 442.8696 by 5.68 (5)

(b) **Subtract the following and find the sum of the answers:** (5)

84327		28596		54927	
38769		19848		39878	
	+		+		=

3. Find the exact amount of each of the following and the total: (10)

10 % of	$2.75	$
$62\frac{1}{2}\%$ "	3.00	
$87\frac{1}{2}\%$ "	85.00	
$14\frac{2}{7}\%$ "	$85.40	
$66\frac{2}{3}\%$ "	$400.00	
Total		$

Part II

4. A butcher, having 2448 lb. of bacon, sold $16\frac{2}{3}\%$ of it at 48¢ a pound; 50% of what he had left at 47¢ a pound, and the remainder at 43¢ a pound. (a) How much did he receive for all? (b) At what average price per pound did he sell it?

5. J. W. Harris & Company, Denver, Col., bought of Moor, Bennett & Co., New York, N. Y., terms: 3/30 n/90:

8 pc. B. Serge $48\frac{1}{4}$, $39\frac{1}{2}$, $44\frac{1}{4}$, $50\frac{1}{2}$, $45\frac{3}{4}$, $43\frac{1}{4}$, $46\frac{1}{2}$, $47\frac{3}{4}$ @ $4.25
7 pc. W. Jersey cloth $41\frac{1}{4}$, $43\frac{1}{2}$, $47\frac{3}{4}$, $48\frac{1}{4}$, $44\frac{3}{4}$, $48\frac{1}{2}$, $46\frac{1}{4}$ @ $3.50 per yd.

Make out the bill in correct form and find the amount, if it was paid in 30 days.

6. Lawn mowers are listed at $15 each, less $33\frac{1}{3}\%$ and 5%. A dealer bought 3 dozen at this price and sold them at the same list price, less 10% and 2%. (a) How much profit did he make? (b) What per cent of profit did he make on the net cost?

7. A produce buyer shipped a commission merchant 3500 bu. of potatoes. The merchant sold the potatoes, deducted his commission of 3% for selling them, and remitted the proceeds, amounting to $6111, to his principal. For how much per bushel did he sell the potatoes?

8. Find the interest, at $5\frac{1}{2}\%$, on $12,842.60 from June 14, 1928, to March 24, 1929.

9. A man bought an automobile for $1500. He paid $300 cash, and in settlement of the balance gave a note for $1200, with the interest added at 6% for 6 months. (a) Find the face of the note. This note was discounted at 6% by the payee on the day he received it, June 3, 1929. (b) Find the proceeds.

10. On a note for $800 dated January 6, 1928, with interest at 6%, the following payments were endorsed: July 10, 1928, $300; Oct. 5, 1928, $200; December 8, 1928, $100. How much was due January 6, 1929?

TEST 54

To follow Assignment 54

Part I

1. Find the cost of: (10)

4 planks	14′ × 12″ × 2″	at $50 per M.	$
8 boards	12′ × 8″ × 1″	at $48 per M.	
5 pc. Compo. Board	4′ × 16′	at 5¢ per square foot	
		Total	$

2. Find the cost of: (10)

9,860 lb. of Feed	at $44	per ton	$
25,800 lb. of Hay	at $18	per ton	
12,400 lb. of Straw	at $11.50	per ton	
		Total	$

3. Find the commission at $2\frac{1}{2}\%$ on: (10)

550 bu. Potatoes,	sold at $1.67	per bushel	$
300 bbl. Apples,	sold at $4.75	per barrel	
400 bkt. Grapes,	sold at 70¢	per basket	
		Total	$

Part II

4. A merchant bought an invoice of goods amounting to $2375 on the following terms: 6%, 10 days; or 4 months' credit. He discounted his 4-months' note at the bank at 6%, and paid cash for the invoice. How much did he gain?

5. A merchant bought shoes at $6 per pair, less 10% discount. At what price must he mark the shoes so that his profit will be 40% after allowing his customers 20% discount?

6. If $150 is deposited in a savings bank every six months for 4 years and if interest at 4% is credited every 6 months, what will be the balance at the end of the fourth year?

7. The assessed valuation of the property in a certain town was $1,560,000, and the amount of tax to be raised was $35,568.

(a) What was the tax rate? (b) How much were the taxes on a piece of property assessed for $4350?

8. Property valued at $20,000 is insured for $15,000 in three different companies, each company carrying an 80% co-insurance clause policy of $5000, for 3 years at a premium of 75¢ per $100 for the full time. The property is damaged to the extent of $12,000. (a) How much would each company have to pay? (b) What would be the actual net loss of each company?

9. At one time a speculator bought 300 shares of A. T. S. F. R. R. stock for $87\frac{3}{4}$ and sold it for $96\frac{3}{8}$; and at another time he bought 400 shares of U. P. Pfd. at $99\frac{1}{4}$ and sold it at $97\frac{1}{2}$. The broker charged $20 per 100 shares for buying and for selling this stock. Show the results of each purchase. (Tax, 2¢ per share on stock sold.)

10. Which is the better investment, and how much better: bonds purchased at 105 and paying $6\frac{1}{2}\%$ interest, or bonds bought at $87\frac{1}{2}$ and paying $5\frac{1}{2}\%$?

TEST 55

To follow Assignment 55

Part I

1. Solve: (10)

(a) $37\frac{1}{2}\%$ of \$480 is what sum?

(b) $66\frac{2}{3}\%$ of what number is equal to 180?

(c) \$125 is what per cent of \$75?

(d) $12\frac{1}{2}\%$ of \$240 is what per cent of \$600?

2. Find the interest at 6% on each of the following amounts for the different periods given: (10)

Amount	90 *days*	60 *days*	30 *days*
\$1850.00	\$	\$	\$
9560.00			
428.70			
35.60			
	\$	\$	\$

3. Solve mentally the following: (10)

$$28 \times 12\tfrac{1}{2} \div 7 - 23 \div 9 \times 81 - 1 \div 11 \times 9 \div 3 + 32 \div 7 \times 6 \div 12$$

Part II

4. An apartment house was rented for \$16,800 a year. The expenses were as follows: taxes, \$1830; fuel, \$920; repairs, \$369; janitor, \$1200. If investments of this kind are expected to pay 7%, how much could be paid for the apartment house?

5. The discounts on an invoice of goods amounted to \$1242.70 and the discounts were 25%, 20%, and 5%. What was the gross amount of the invoice?

6. (a) Mark the following articles to sell at a profit of 40% on the invoice price, using the marking key *a*, *b*, *c*, *home run*, for the cost prices and figures for selling prices: 20 sets of knives and forks invoiced at \$3.80 a set; 15 doz. spoons invoiced at \$5.90 a dozen; 2 doz. carving sets invoiced at \$4.75 a set. (b) What will be the gross profit on this invoice when all the articles are sold?

7. I directed my agent to buy 5000 lb. of coffee at 32¢ a pound. He charged 2% for buying and packing. The other charges were: freight and cartage, \$23.37, and storage, \$11.30. For how much a pound must I sell this coffee to gain 50% on the gross cost?

8. For how much must a merchant give his 90-day note at 6% interest so that, when it is discounted at 6%, the proceeds will just pay a bill of \$2999.32?

9. Find the Federal income tax on the following incomes: *A's* income is \$28,600; *B's* income is \$31,400 and, *C's* income is \$3,475. *A* is married, *B* is married and has 3 dependents, and *C* is single.

10. How much can be paid for an issue of \$100,000 of $4\frac{1}{2}\%$ bonds in order to yield an income of 5% on the investment?

TEST 56

To follow Assignment 56

Part I

1. (a) 15% of 60 is what per cent of 80?

(b) 20% of 75 is what per cent of 45?

(c) 125 is what per cent of 75?

(d) 145% of 66.5 is equal to how many? (10)

2. (a) If 60% of a number is 45, how many is 20% of the same number?

(b) If 125% of a number is 75, how many is 75% of the same number? (10)

3. (a) A number increased by 20% of itself is 108. What is the number?

(b) A number decreased by 25% of itself is 60. What is the number? (10)

4. (a) Express $4.03\frac{1}{3}$ as a mixed number.

(b) Express 3.025 as a per cent.

(c) Express $\frac{5}{8}$ as a decimal.

(d) Express \$2.40 per ton (2000 lb.) in price per pound.

(e) Express $8\frac{3}{4}¢$ per foot in price per M. feet. (10)

Part II

5. A man purchased a two-family house for \$22,000. His expenses were as follows: taxes, \$454.60; water bill, \$40.40; repairs, \$340; insurance, \$25. For how much a month must he rent this house in order that a net profit of 7% may be realized on the original investment?

6. A merchant had been selling for \$8.50, a pair of shoes that cost \$5.75. In order to increase his sales, he reduced the price to \$7.45. As a result, his average daily sales increased from 12 to 34 pairs. If his selling expenses remained the same, how much were his daily profits increased?

7. A dealer bought a piano for \$425, less 20% and 10%. At what price must he sell this piano in order to gain 40% on the selling price?

8. Find the proceeds of a 3-months' 6% interest-bearing note for \$1250, dated Sept. 10, and discounted Nov. 1, at 6%.

9. A man bought five building lots, measuring 40 ft. front by 100 ft. deep, at \$700 each. During the time he owned these, he paid an assessment of \$2.70 per foot of frontage and taxes amounting to \$60. At what price must he sell each of these lots in order to make a profit of 25% on the total cost?

10. A dealer reduced the price of bicycles from \$35 to \$29.50 and advertised a special sale for two days at a discount of 10% on the reduced price. The bicycles cost \$21.60. (a) At the sale price, what was the rate of discount on the original marked price? (b) What per cent of profit did he make on the cost price? (Carry answer to two decimal places.)

TEST 57

To follow Assignment 57

Part I

1–2. Add (5)

28462
31578
52643
79287
34379
29287
54292
73824
67295
69273

(b) **Find the result of:** (5)

$\frac{7}{8} \times \frac{5}{6} \times 5$

$\frac{5}{6} \div \frac{3}{4}$

$\frac{5}{8} - \frac{5}{12}$

(c) **Divide** (5)

33.54)103.4709(

(d) **Make extensions for the following items:** (5)

124	doz.	@ \$	.62½	\$
78	"	"	.83⅓	
96	"	"	1.25	
8	"	"	.95	
66⅔	"	"	33.00	
			Total	\$

Part II

3. Find the cost in U. S. money of a pile of wood 34.25 meters long, 2.75 meters wide, and 2.5 meters high, at 50 francs a stere. (A stere is a cubic meter, and a franc is worth \$0.0391¾.)

4. (a) Find the number of square yards in the outer surface of a house 52 ft. long, 28 ft. wide, and 18 ft. to the eaves. The gable ends are 14 ft. high and 28 ft. long. (b) How much will it cost at 45¢ per square yard to paint this house?

5. Green coffee costing 24¢ a pound lost 20% of its weight in roasting. For how much per pound must it be sold in order to make a profit of 40%?

6. (a) How much must be invested in stock at $124\frac{1}{2}$, paying a dividend of 7%, in order to realize a semiannual income of $700. (b) At the end of three years the stock was sold for $133\frac{1}{4}$. What was the total net income, if $\frac{1}{8}$% brokerage was charged for buying and for selling the stock and seller's tax was 2¢ a share?

7. A man is renting a house for $125 per month. He can buy the house for $12,500. The taxes are $320 a year; insurance, $45 for 3 years, and repairs, about $200 a year. If his money is worth 7% to him in his business, which is the better proposition for him, and how much better: to buy the house or to pay rent?

8. A grain dealer bought 120,000 bu. of wheat, on the Minneapolis market, for $1.68 a bushel and shipped it to Buffalo. The charges were as follows: commission for buying, $\frac{1}{2}$¢ a bushel; for loading, $1\frac{1}{2}$¢ a bushel; and for freight to Buffalo, $3\frac{3}{8}$¢ a bushel. The wheat was sold in Buffalo for $2.03 a bushel. Commission was $\frac{1}{2}$¢ a bushel for selling. When the wheat was weighed, there was a shortage of 1560 pounds. How much was gained?

9. Three partners gained $18,360 from the year's business. *A's* investment was $12,000; *B's*, $10,000, and *C's*, $8000. After allowing each partner 6% interest on his investment, the gain was divided equally. How much did each partner receive?

10. A debt of $27,500 is due in 9 months. What is its worth now, if money is bringing 6% interest?

TEST 58

To follow Assignment 58

PART I

1. Find the totals as indicated: (10)

2468 + 3724 + 2964 + 2964 =
3927 + 8642 + 1728 + 7821 =
8426 + 9264 + 8275 + 2927 =
9275 + 1728 + 3921 + 4863 =
1342 + 3927 + 1724 + 7428 =
=

2. Find the discounts and net cost as indicated: (10)

Gross Cost	*Rates of Discount*	*Discount*	*Net Cos*
$1240	10 % and 5%	$	$
1570	15 % and 4%		
2460	$12\frac{1}{2}$% and 2%		
3680	20 % and 6%		
	Totals	$	$

3. Find the interest at 6% on each of the following, and the total: (10)

$1200.	for 46 days	$
14.68	" 30 days	
248.60	" 90 days	
324.00	" 45 days	
880.00	" 15 days	
	Total	$

Part II

4. Find the net amount of the following invoice:

1430 yd. at $62\frac{1}{2}¢$ a yard	$
1260 yd. at $1.24 a yard	
1890 yd. at $3.12 a yard	
768 yd. at $2.28 a yard	$

Less discounts of 8% and 2%

5. A piano was bought for $375, less 20% and 10%, and marked to sell at a profit of $33\frac{1}{3}$% after allowing the purchaser 10% discount. What was the marked price?

6. Jackson & Company had their 6-months' note for $1800, dated June 14, 1929, at 6% interest, discounted at the bank on June 21, 1929, at 6%. Find the net proceeds.

7. A man paid $125,800 for an apartment house, from which he received a net annual income of $8491.50. He sold the apartment house for $143,500 net, and invested this amount in 6% bonds at $102.50. Did his annual income increase or decrease, and how much?

8. An automobile sales company offered for sale a certain automobile for $1500 cash, or $250 cash and $117.50 a month for 12 months. If the cost of insurance was $75.40, what additional per cent did the company charge on the deferred payments?

9. Equal quantities of coffee costing 26¢, 28¢, 30¢ a pound are mixed and sold for 38¢ a pound. (a) What per cent of profit was made on the mixture? (b) How much was made on 600 pounds sold?

10. (a) How many acres are there in a farm 380 rods long and 120 rods wide? (b) How much will it cost to divide this farm into four rectangular fields of equal size and enclose each field with a fence, at a cost of $2.80 per rod?

TEST 59

To follow Assignment 59

Part I

1. Find the cost of: (10)

4 gal.	at 12¢ a pint	$
12 bu.	at 65¢ a peck	
27 eggs	at 72¢ a dozen	
3 doz. oranges	at 8 for 35¢	
9 ounces	at $4.80 a pound	
		$ _____

2. (a) **Using the current year, find the exact time in days:** (10)

From Mar. 6 to July 11, 1929.
From Jan. 4 to June 16, 1929.
From Dec. 14, 1929, to August 4, 1930.
From Oct. 11, 1929, to March 4, 1930.

(b) Find the interest on $1200 at 6% for the different number of days under (a).

3. (a) Multiply $81\frac{3}{4} \times 16\frac{1}{5}$. (10)

(b) Subtract $19\frac{2}{3}$ from $37\frac{3}{8}$.

Part II

4. How much will it cost, at $2.20 a yard, to carpet a room 22 ft. long by 18 ft. wide, with carpet a yard wide, if $2\frac{1}{4}$ yards are wasted in matching the pattern, and the strips run lengthwise of the room?

5. Find the cost of building a walk 3 ft. wide, on two sides of a lot 60 ft. by 120 ft., using bricks $8'' \times 4'' \times 2''$, at $11 a thousand. The bricks are laid flat; $\frac{1}{6}$ is allowed for sand, at a cost of $16.80; and it took two workmen 9 days each, at $12.50 per day, to do the job.

6. An importer bought 350 yards of English serge at 10s., 6d. a yard. The duty was 40% ad valorem; the freight was £6, 4s., and the rate of exchange was $4.865. He sold the entire lot at a gain of 25% on the gross cost. How much was his gain in U. S. money?

7. A dealer is offered goods listed at $1825, less 10%, 10% and 5% discount on 30 days' credit, or 25% off for cash. How much profit can he make by borrowing the money for 30 days at 6% and paying cash for the goods?

8. A certain company's net earnings for the year were $142,750. The amount of common stock is $1,500,000 and of preferred stock, $500,000. The directors declared a dividend of 7% on the preferred stock. (a) What

even rate of dividend can they declare on the common stock? (b) How much will be left in the undivided profit amount? (c) How much would a stockholder receive who holds 25 shares of preferred stock and 40 shares of common stock?

9. The Hartford Fire Insurance Company insured goods to the amount of \$127,500 at $2\frac{1}{2}\%$, and reinsured $\frac{3}{4}$ of the risk in the Philadelphia Insurance Company at $2\frac{1}{4}\%$. The goods are totally destroyed by fire. Find each company's net loss.

10. A 6% interest-bearing note for \$2500, dated January 10, 1928, has the following payments endorsed upon it: April 16, \$500; July 16, \$750; October 1, \$500. Find the amount due on January 10, 1929.

TEST 60

To follow Assignment 60

Part I

1. Find the selling price of the following, and the average per cent of profit: (10)

Cost	*Gain*	*Selling Price*
\$240	$37\frac{1}{2}\%$	\$
450	$16\frac{2}{3}\%$	
112	75 %	
135	$33\frac{1}{3}\%$	
188	5 %	\$
	Total	\$

2. Find the trade discount on each of the following: (10)

List Price	*Rates of Discount*	*Discount*
\$1600	$12\frac{1}{2}\%$, 10%	\$
2500	10 %, 5%	
900	$33\frac{1}{3}\%$, 8%	
1250	8 %, 2%	
375	15 %, 4%	
	Total	\$

3. Find the interest on each of the following at 6%, and the total: (10)

\$1792.42 for 66 days
240.00 " 114 days
\$2280 for 42 days
900 " 88 days
\$3000 for 4 days

Part II

4. Clark and Morrow, of 60 Grove Street, Denver, Colo., purchased from Grant and Hayes, 28 State Street, Chicago, Ill., terms 2/10 n/30, the following: 8 pieces of U. B. cotton, $40\frac{1}{4}$, $43\frac{1}{2}$, 41, $46\frac{3}{4}$, 47, $48\frac{1}{4}$, 45, 44, at $6\frac{3}{4}$¢; 7 pieces of B. muslin, 38, $37\frac{1}{4}$, $39\frac{1}{2}$, 36, $34\frac{3}{4}$, $35\frac{1}{2}$, 37, at $8\frac{3}{8}$¢; 6 pieces of delaine, 39, $42\frac{1}{4}$, $38\frac{3}{4}$, $37\frac{1}{2}$, 39, $41\frac{1}{4}$, at $12\frac{1}{2}$¢. Make out a bill in correct form and show the net amount for cash.

5. On January 12, Jarvis deposited $10,000 with his broker and directed him to purchase 100 shares of Boston R. T. at $92\frac{1}{2}$. On January 25, he directed his broker to sell. The stock was sold for $99\frac{1}{4}$. If the broker charged $20 per 100 shares for buying and $20 per 100 shares for selling the stock, how much did Jarvis make on the transaction? (Federal tax, 2¢ per share.)

6. A man holds a note for $750, dated October 11, and payable the following April 11, with interest at 6%. What will be the net proceeds, if he has this note discounted at the bank at 6%, on the following January 2?

7. A retailer sold a stove to a customer for $58.80, at a profit of 40%; the jobber sold it to the retailer at a profit of 25%; and the manufacturer sold it to the jobber at a profit of 25%. How much above the manufacturer's price did the customer pay for the stove?

8. A commission agent rendered an account purchase of tea to his principal. The bill amounted to $413.88, which included cartage charges of $6 and his commission of 3%. If he paid 33¢ a pound for tea, how many pounds did he buy?

9. A room 24 ft., 6 in. by 18 ft. is to be floored with material costing $155 per thousand square feet. Find the cost, allowing $40 for labor and 6% for waste in matching.

10. At $1.80 per square yard, what will it cost to build a cement walk 5 ft. wide around the outside of a plot 150 ft. square?

TEST 61

To follow Assignment 61

Part I

1. How many articles will: (10)

$132	buy at	66¢ each
96	"	$37\frac{1}{2}$¢ "
90	"	15¢ "
15	"	25¢ "
48	"	$16\frac{2}{3}$¢ "

2. Find the results of: (10)

$\frac{1}{4}$%	of $122
150%	of $360.50
$66\frac{2}{3}$%	of $960
$\frac{3}{8}$%	of $840
250%	of $12

Part II

3. A dealer bought 760 tons of coal at \$9.40 per long ton, and sold it at \$15.75 per short ton. How much did he gain, if the waste was 2400 lbs. and the cost for freight and handling was \$2325?

4. The assessed valuation of the property in a town is \$2,840,000. The budget for annual expenses is as follows: interest on bonds, \$7500; schools, \$26,924; salaries of town officers, \$13,500; streets, \$10,000; sundry items, \$2000. (a) What should be the tax rate per \$1000? (b) How much would the taxes be on property assessed for \$12,800?

5. A rectangular tank is 8.5 m. long, 4 m. wide, and 3 m. deep. How long, in minutes and seconds, will it take to fill this tank, if the inflow of water is 150 liters per minute? (Refer to the table on p. 78).

6. A man purchased 200 shares of stock at $88\frac{1}{2}$ a share; brokerage, \$20 per 100 shares. (a) If the stock pays a semiannual dividend of $2\frac{1}{2}\%$, what will be his annual income from this investment? (b) What per cent will his money earn yearly?

7. A merchant insured his \$25,000 stock of goods for \$20,000. The stock was damaged by fire and water to the extent of \$12,800. (a) What amount of this loss should be paid by a company having a policy of \$10,000 on this stock, if the policy contained the 80% co-insurance clause? (b) What was the company's net loss, if the premium charged was 75¢ per \$100?

8. Find the cost in U. S. money of an invoice of goods purchased in Paris for 12,892 francs, if the rate of exchange was \$0.0392, and the freight amounted to 700 francs.

9. A retail merchant bought an article for \$56, less a discount of 25% and 10%. At what price must he mark the article to be sold, in order to make a profit of 50%, after allowing 10% discount on the marked price?

10. A tract of 52 acres of land was divided into 200 building lots, 75 ft. by 125 ft. each. All the lots were sold at an auction sale, at an average price of \$15 per foot front. If the land was purchased at \$2850 per acre, and the development expenses were \$25,000, what was the gain?

TEST 62

To follow Assignment 62

Part I

1. At the opening of business Monday, Jan. 2, a certain firm's bank account showed a balance of \$1784.90. The deposits for the week were as follows: Jan. 2, \$824.30; January 3, \$391.20; January 4, \$487.60; January 5, \$516.12; January 6, \$725.60; January 7, \$907.40. The checks issued during the week were as follows: January 2, \$42.70, \$39.50, \$28.90; January 3, \$310, \$24.60, \$72.80, \$13.65; January 4, \$150, \$290.75, \$129.50, \$10; January 5, \$128, \$211.60; January 6, \$75, \$95.40, \$125; January 7, \$340,

$120, $12.80. Find their bank balance, according to their record, at the close of business on Jan. 4, and again on Jan. 7. (10)

2. Solve to find the missing value in each of the following, and prove your work: (10)

24 is____% of 480	$\frac{7}{8}$ of_____is equal to $\frac{3}{7}$ of 196
15% of 210 is_____	____% of 6 is 8
____% of 350 is 42	24 is____% of 6
$\frac{3}{4}$ of_____is 72	$\frac{1}{4}$% of_____is 24

Part II

3. Find the total cost of this invoice of lumber:

120 pc. Yellow Pine	2″ × 4″ × 12′	@ $50	per M.
60 pc. "	2″ × 6″ × 14′	@ $55	per M.
80 pc. Hemlock	2″ × 10″ × 16′	@ $48	per M.
30 pc. "	3″ × 8″ × 18′	@ $54	per M.
350 ft. Molding		@ 4½¢	per foot
18,000 Shingles		@ $6.25	per M.

4. At $3.50 per cubic yard for rock and $1.25 per cubic yard for earth, what will it cost to excavate for a cellar 46 ft. long, 25 ft. wide, and 6 ft. deep, $\frac{1}{3}$ of the excavation being rock?

5. Hooker bought a house for $16,500, paying $6500 in cash and giving a purchase money mortgage for $10,000, at 6% interest. The expenses for the first year were as follows: taxes, $340; insurance, $20; water tax, $36; and repairs, $144. If he allows 2% for depreciation, and 6% interest on his equity, his total carrying charges are equal to what rental per month?

6. Machinery which cost $128,000 was valued at the end of five years, at $95,800. (a) What was the average annual decrease in value? (b) What per cent of the cost of the machinery was the total depreciation? (c) What per cent of the original cost was deducted each year for depreciation? (Find the average per cent.)

7. A business man failed in business with liabilities amounting to $34,650. His assets amounted to $22,522.50. (a) How much can he pay on a dollar of his liabilities? (b) How much will Jackson, whom he owes $1580, and Harper, whom he owes $848.75, each receive?

8. A merchant bought goods amounting to $2460.80 on the following terms: 6% trade discount; and 2% for cash, net 60 days. He discounted his 60-day note at 6% for an amount sufficient to pay the net amount of the bill. (a) What was the face of the note? (b) How much did he gain by discounting his note and taking advantage of the 2% cash discount?

9. An agent received $2500 from his principal with instructions to buy butter. (a) How many fifty-pound tubs at 48¢ a pound could he buy, if his expenses were $2.40, and he charged 2% for buying? (b) How much did he have left to return to his principal?

10. Which is the better investment and how much better: (a) $26,250 invested in 5% bonds at $104\frac{7}{8}$, or (b) 4% bonds at $74\frac{7}{8}$, brokerage being $\frac{1}{8}$% in each case?

TEST 63

To follow Assignment 63

Part I

1–2. Add: (20)

2496	7824	2874	7295	7843
3921	9265	8765	3164	1729
8427	3786	9267	6927	2843
6924	4297	2743	8426	4728
3728	3142	1428	2972	6745
8764	8764	8726	3728	3729
3925	9265	2342	8742	2964
8267	7342	7926	2926	3728
1476	1248	3925	3874	3724
2971	3792	2742	1429	8265

3. Find the interest on the following, at 6%: (10)

$3400	for	21	days $
1678	"	30	"
920	"	84	"
350	"	9	"
720	"	11	"
		Total	$

Part II

4. A merchant bought 450 yards of cloth at $1.96 per yard. He estimated that 2% would be wasted by salesclerks in careless measuring. At what price per yard must he mark it to gain 50% on the cost price and allow for the waste?

5. A merchant's sales for each year, over a period of ten years, were as follows: $12,250, $15,500, $17,850, $21,375, $26,900, $31,280, $35,780, $32,300, $34,600, $38,700. Prepare a graph to exhibit the comparison year by year.

6. A miller purchased 20,000 bu. of wheat through a broker, at \$2.07 per bushel of 60 pounds. If the broker charged 2% commission, and the freight charges were 7¢ per hundred pounds, what was the total cost of the wheat?

7. Find the proceeds of a 6-months' interest-bearing note for \$2500, dated January 16, 1929, and discounted April 16, 1929, at 6%.

8. A retailer marked his goods to make a profit of 50% on the gross cost. During a special sale of one week he offered all goods at a discount of 20%. His sales for that week amounted to \$9660. What was his gross profit from this sale?

9. A furniture dealer, whose sales for one year amounted to \$49,525, had his goods marked to make a profit of 75% on the gross cost. The next year he reduced the prices on all goods to make a profit of only 35% on the gross cost. His sales for this year were \$102,937.50. How much did he gain or lose for the year by reducing his prices, as compared with the previous year?

10. The cost of ice for a family averages \$6.50 per month for the year. An electric refrigerator is installed at a cost of \$330. It will cost \$34.60 a year to operate. Estimating that the refrigerator will last twenty years, and allowing 6% interest on the investment, which do you find to be the more economical?

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